AD-A141 550

INSTALLATION RESTORATION PROGRAM
PHASE I: RECORDS SEARCH
KEESLER AFB, MISSISSIPPI

Prepared For

United States Air Force
HQ ATC/DEV
Randolph AFB, Texas
and
AFESC/DEV
Tyndall AFB, Florida

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Prepared By

ENGINEERING-SCIENCE
57 Executive Park South, N.E.
Suite 590
Atlanta, Georgia 30329

84 05 15 153

PII Redacted

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EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Initial Assessment/Records Search; Phase II, Confirmation/Quantification; Phase III, Technology Base Development; and Phase IV, Operations/Remedial Actions. Engineering Science (ES) was retained by the United States Air Force to conduct the Phase I, Initial Assessment/Records Search for Keesler AFB under Contract No. F08637-80-G0009 5014.

INSTALLATION DESCRIPTION

Keesler Air Force Base is located in southeastern Mississippi, approximately 80 miles east of New Orleans, Louisiana and 80 miles west of Mobile, Alabama, and is within the City of Biloxi. The base is bordered on the north by the Back Bay of Biloxi, and on the west, south, and east by residential and commerical areas. Mississippi Sound is approximately 1/2 mile south of the base.

The base comprises 1,494 acres of U.S. government-owned land, and 117 acres of leased, permit, and easement lands. Remote installation facilities consist of the following:

- Training Annex No. 1 .... 57 acres
- Small Arms Range Annex.............. 1,877 acres

Keesler Air Force Base was activated in 1941 as a training center for aircraft mechanics. During World War II, the base also operated as a Basic Military Training Center. A number of flying missions using varying types and numbers of aircraft have been assigned to Keesler AFB since its inception. Training in electronics areas began at Keesler in 1947, and has expanded to the point that the base is now known as the electronics training center for the Air Force. Since 1967, a flying training mission (T-28 aircraft) and later a flying mission using C-130 aircraft have been associated with Keesler Air Force Base.

ENVIRONMENTAL SETTING

The environmental setting data for Keesler Air Force Base indicate the following major points that are relevant to the evaluation of past hazardous waste management practices:

- Surface soils of the Keesler Air Force Base area are typically sandy and permeable. The water table is generally less than 10 feet below the surface.
- The Coastal Deposits at Keesler AFB are either exposed or very near ground surface. This formation is considered to be an aquifer of limited significance in the study area. The base is located within the recharge zone of this aquifer.
- The mean annual precipitation is 61.3 inches and the net precipitation is calculated to be 13.3 inches.
- The major regional aquifer exists at great depth in the study area (about 500 feet below ground surface). The regional aquifer is recharged at some distance from the base, but may receive some local recharge as leakage through semi-pervious zones from overlying shallow aquifers.
- No evidence of contamination identified in wells constructed in the regional aquifer has been identified.
- Flooding is known to be a problem typical of the Keesler Air Force Base area.
- The surface water streams exiting the base are considered to comply with water use classification.
- No threatened or endangered species are indigenous to Keesler Air Force Base.

From these major points, it may be seen that potential pathways for the migration of hazardous waste-related contamination exist. If hazardous materials are present in or on the ground, they may encounter a shallow aquifer and subsequently be discharged to area surface waters. The potential for the migration of contamination to the major regional aquifer is considered to be remote.

METHODOLOGY

During the course of this project, interviews were conducted with base personnel (past and present) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state, and federal agencies; and field and aerial surveys were conducted at suspected past hazardous waste activity sites. Sites located within Keesler AFB boundaries were identified as potentially containing hazardous contaminants and having the potential for migration resulting from past activities (Figures 1 and 2). These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration, and waste management practices. The details of the rating procedure are presented in Appendix G and the results of the assessment are given in Table 1. The rating system is designed to indicate the relative need for follow-on action. The sites have also been reviewed with regard to future land use restrictions.

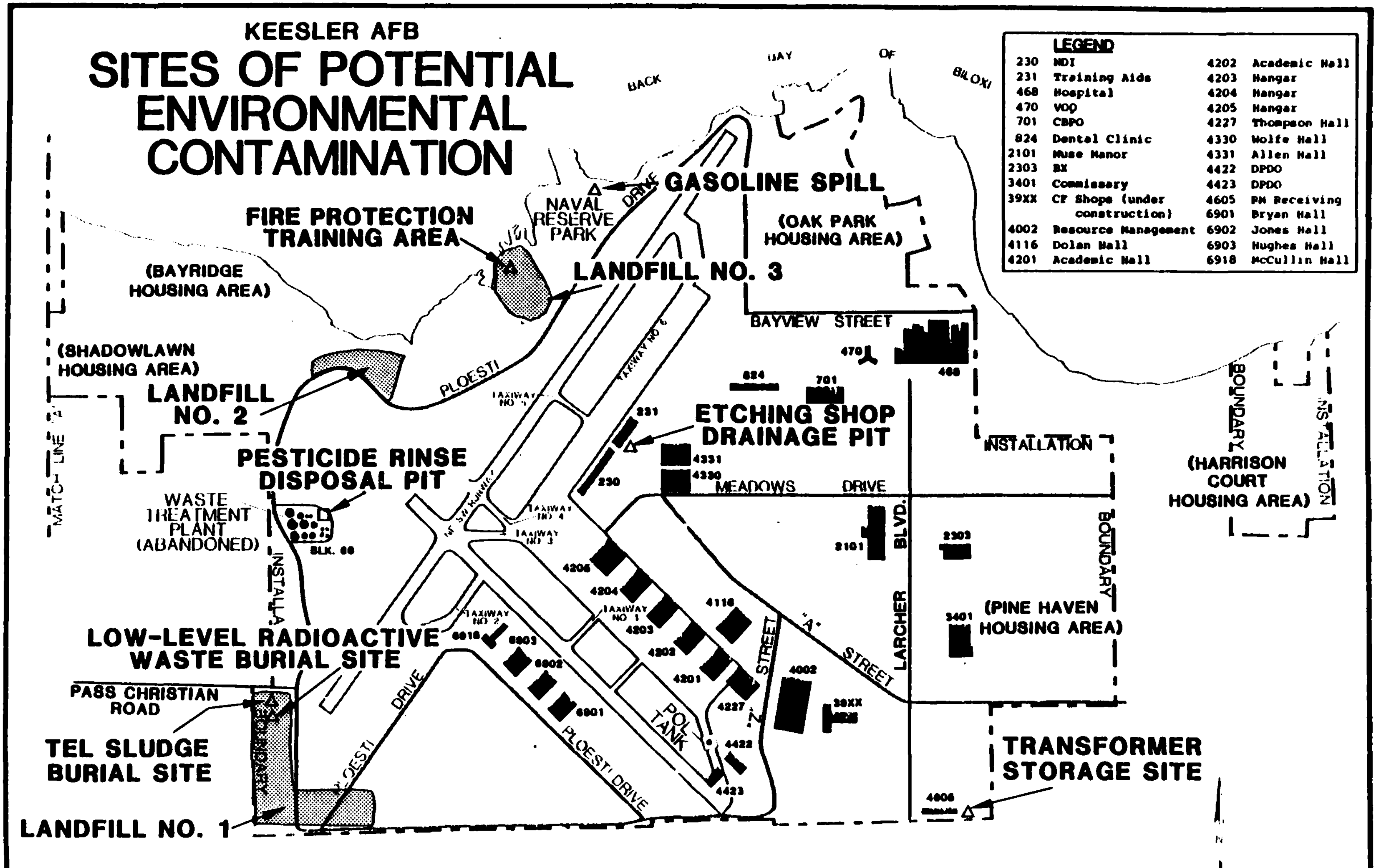
FINDINGS AND CONCLUSIONS

The following conclusions have been developed based on the results of the project team's field inspection, review of base records and files, and interviews with base personnel.

Each of the eight sites listed below was ranked using the HARM system and was determined to have a sufficient potential for environmental contamination to warrant some degree of follow-on investigation.

Etching Shop Drainage Pit
Fire Protection Training Area
Landfill No. 2

FIGURE 1



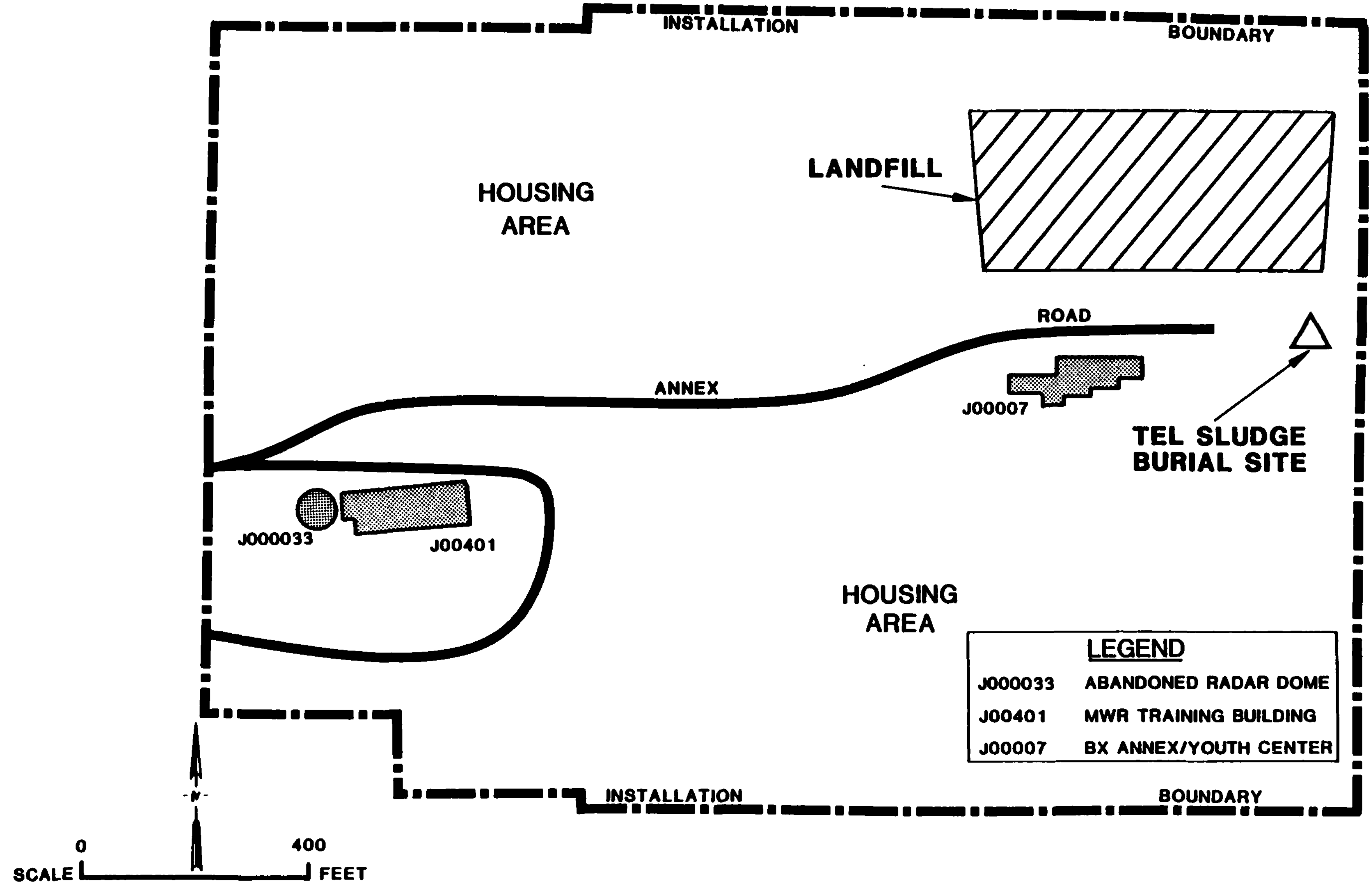
NOTE: THE FOLLOWING SITES ARE NOT LOCATED ON THE MAIN BASE AREA:
1) TEL SLUDGE BURIAL SITE IN TRAINING ANNEX NO. 1
2) LANDFILL AT TRAINING ANNEX NO. 1
3) GASOLINE SPILL AT NAVAL RESERVE PARK

SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

FIGURE 2

KEESLER AFB

SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION – TRAINING ANNEX NO. 1



LEGEND	
J000033	ABANDONED RADAR DOME
J00401	MWR TRAINING BUILDING
J00007	BX ANNEX/YOUTH CENTER

SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

TABLE 1
SITES EVALUATED USING THE
HAZARD ASSESSMET RATING METHODOLOGY FORMS
KEESLER AIR FORCE BASE

Rank	Site	Operating Period	Final Harm Score
1	Etching Shop Drainage Pit	1941 - 1981	74
2	Fire Protection Training Area	1955-Present	71
3	Landfill No. 2	Late 1940's	67
4	Transformer Storage Site	1960's- 1972	61
5	Pesticide Rinse Disposal Pit	1960's- 1981	61
6	TEL Sludge Burial Site in Landfill No. 1	1942	58
7	TEL Sludge Burial Site in Training Annex No. 1	1970	56
8	Landfill No. 3	1950 - 1974	53
9	Landfill No. 1	1941 - 1950	49
10	Landfill at Training Annex No. 1	1968 - 1971	48
11	Gasoline Spill at Naval Reserve Park	1983	7
12	Low-level Radioactive Waste Burial Site	1950's- 1960	6

Transformer Storage Site

Pesticide Rinse Disposal Pit

Tetraethyl Lead (TEL) Sludge Burial Site in Landfill No. 1

Tetraethyl Lead (TEL) Sludge Burial Site in Training Annex No. 1

Landfill No. 3

RECOMMENDATIONS

A program for proceeding with Phase II of the IRP at Keesler AFB is presented in Section 6. The Phase II recommendations are summarized as follows:

Etching Shop Drainage Pit - Conduct soil borings, collect and analyze soil samples.

Landfill No. 2 - Install monitoring wells at four locations. Obtain and analyze surface water samples at three locations.

Fire Protection Training Area and Landfill No. 3 - Consider as a single site for monitoring purposes. Install monitoring wells at four locations. Collect and analyze ground water and obtain surface water samples.

Transformer Storage Site - Collect and analyze surficial (0.5 foot deep) soil samples at four locations.

Pesticide Rinse Disposal Pit - Install three monitoring wells. Collect and analyze ground-water samples.

Tetraethyl Lead (TEL) Sludge burial Site at Training Annex No. 1 - Install three monitoring wells. Collect and analyze ground-water samples.

Tetraethyl Lead (TEL) Sludge Burial Site at Landfill No. 1 and Landfill No. 1 - Install five to ten monitoring wells. Collect and analyze ground-water samples.

SECTION 1

INTRODUCTION

BACKGROUND AND AUTHORITY

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of past disposal sites and take action to eliminate hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Section 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and under Section 3012, state agencies are required to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, DOD developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, by Executive Order 12316, and 40 CFR 300 Subpart F (National Contingency Plan). CERCLA is the primary legislation governing remedial action at past hazardous waste disposal sites.

PURPOSE AND SCOPE OF THE ASSESSMENT

The Installation Restoration Program has been developed as a four-phased program as follows:

Phase I	- Initial Assessment/Records Search
Phase II	- Confirmation/Quantification
Phase III	- Technology Base Development
Phase IV	- Operations/Remedial Actions

Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I Records Search at Keesler Air Force Base under Contract No. F08637-80-G0009 5014. This report contains a summary and an evaluation of the information collected during Phase I of the IRP. The land areas included as part of the Keesler AFB study are as follows:

Main Base	1,611 acres
Training Annex No. 1 (Thrower Park)	57 acres
Small Arms Range Annex	1,877 acres

The objective of the first phase of the program was to identify the potential for environmental contamination from past waste disposal practices at Keesler AFB, and to assess the potential for contaminant migration. The activities that were performed in the Phase I study included the following:

- Review of site records
- Interviews with personnel familiar with past generation and disposal activities
- Survey of types and quantities of waste generated
- Determination of estimated quantities and locations of current and past hazardous waste treatment, storage, and disposal
- Definition of the environmental setting at the base
- Review of past disposal practices and methods

- Performance of field and aerial inspection
- Collection of pertinent information from federal, state, and local agencies
- Assessment of the potential for contaminant migration
- Development of recommendations for follow-on actions

ES performed the on-site portion of the records search during January, 1984. The following core team of professionals was involved:

- E. H. Snider, P.E., Chemical Engineer and Project Manager, 7 years of professional experience.
- J. R. Absalon, P.G., Hydrogeologist, 9 years of professional experience.
- R. J. Reimer, Chemical Engineer, 4 years of professional experience.

More detailed information on these individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the Keesler AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and present base employees from the various operating areas. A listing of Air Force interviewees by position and years of service is presented in Appendix B.

Concurrent with the base interviews, the applicable federal, state and local agencies were contacted for pertinent base related environmental data. The agencies contacted and interviewed are listed below as well as in Appendix B.

- U.S. Geological Survey, Water Resources Division
- U.S. Department of Agriculture, Soil Conservation Service
- Mississippi Bureau of Geology
- Mississippi Department of Wildlife Conservation, Bureau of Marine Resources

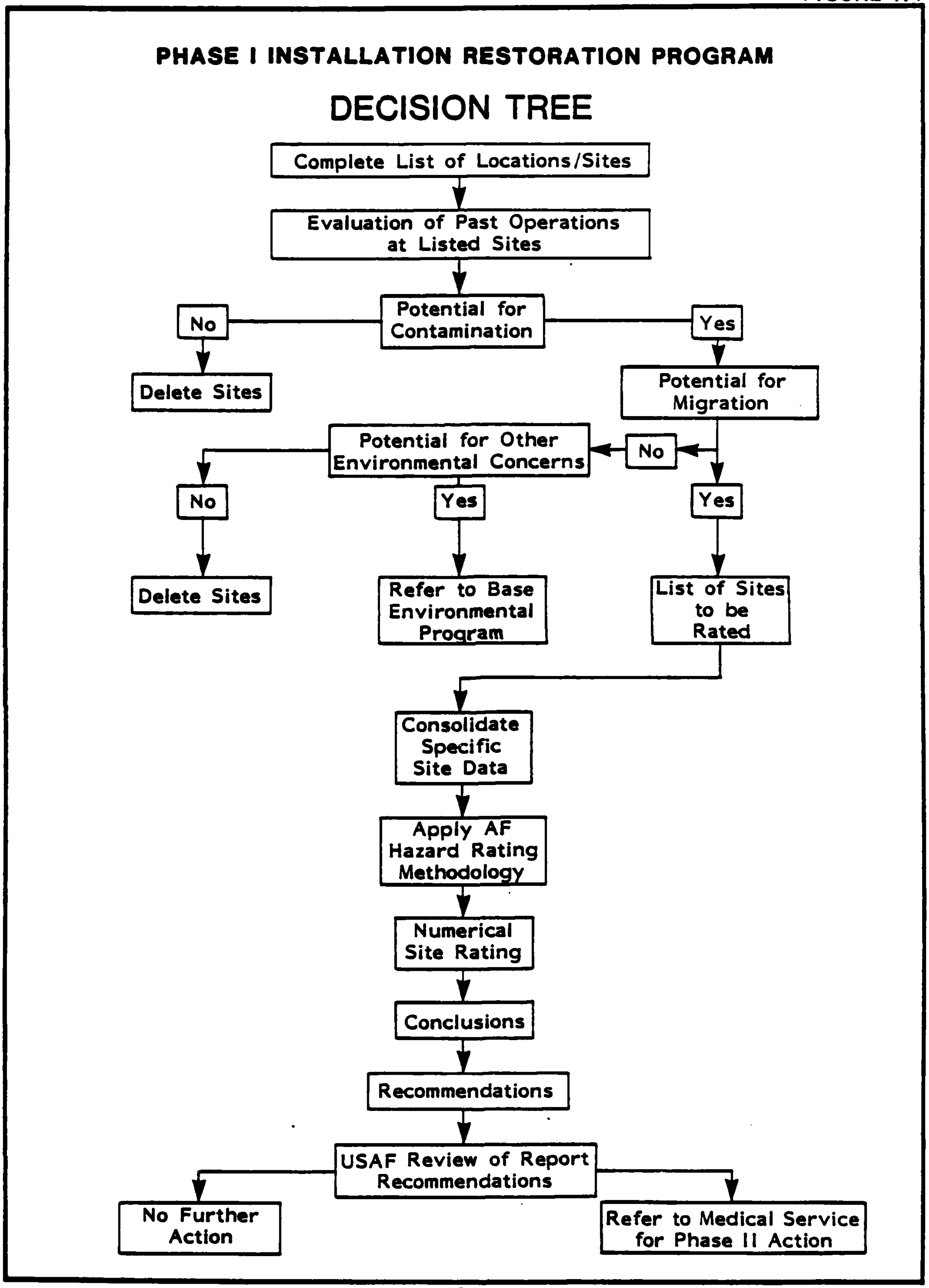
- Mississippi Bureau of Pollution Control, Hazardous Waste Division
- Mississippi Bureau of Pollution Control, Industrial Wastewater Section
- City of Biloxi, Water Department
- U.S. Environmental Protection Agency, Region IV

The next step in the activity review was to identify all sources of hazardous waste generation and to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various Air Force operations on the base. A master list of shops is listed in Appendix E. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as spill areas.

A general ground tour was then made by the ES Project Team to gather site-specific information including: (1) general observations of existing site conditions; (2) visual evidence of environmental stress; (3) the presence of nearby drainage ditches or surface water bodies; and (4) visual inspection of these water bodies for any obvious signs of contamination or leachate migration. Aerial photographs of selected base areas were taken at the request of the Project Team. Several photographs are presented in Appendix F.

A decision was then made, based on all of the above information, whether a potential exists for hazardous material contamination at any of the identified sites using the Decision Tree shown in Figure 1.1. If no potential existed, the site was deleted from further consideration. For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination was made by considering site-specific conditions. If there were no further environmental concerns, then the site was deleted. If there are other environmental concerns, then these are referred to the base environmental program. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in Appendix G.

FIGURE 1.1


PHASE I INSTALLATION RESTORATION PROGRAM
DECISION TREE
Complete List of Locations/Sites
Evaluation of Past Operations at Listed Sites
Potential for Contamination
No
Yes
Delete Sites
Potential for Migration
Potential for Other Environmental Concerns
No
No
Yes
Yes
Delete Sites
Refer to Base Environmental Program
List of Sites to be Rated
Consolidate Specific Site Data
Apply AF Hazard Rating Methodology
Numerical Site Rating
Conclusions
Recommendations
USAF Review of Report Recommendations
No Further Action
Refer to Medical Service for Phase II Action

SECTION 2

INSTALLATION DESCRIPTION

LOCATION, SIZE, AND BOUNDARIES

Keesler Air Force Base is located in southeastern Mississippi approximately 80 miles east of New Orleans, Louisiana and 80 miles west of Mobile, Alabama, and is within the city of Biloxi (see Figures 2.1 and 2.2). The base is bordered on the north by the Back Bay of Biloxi, and on the west, south, and east by residential and commercial areas. Mississippi Sound is approximately 1/2 mile south of the base.

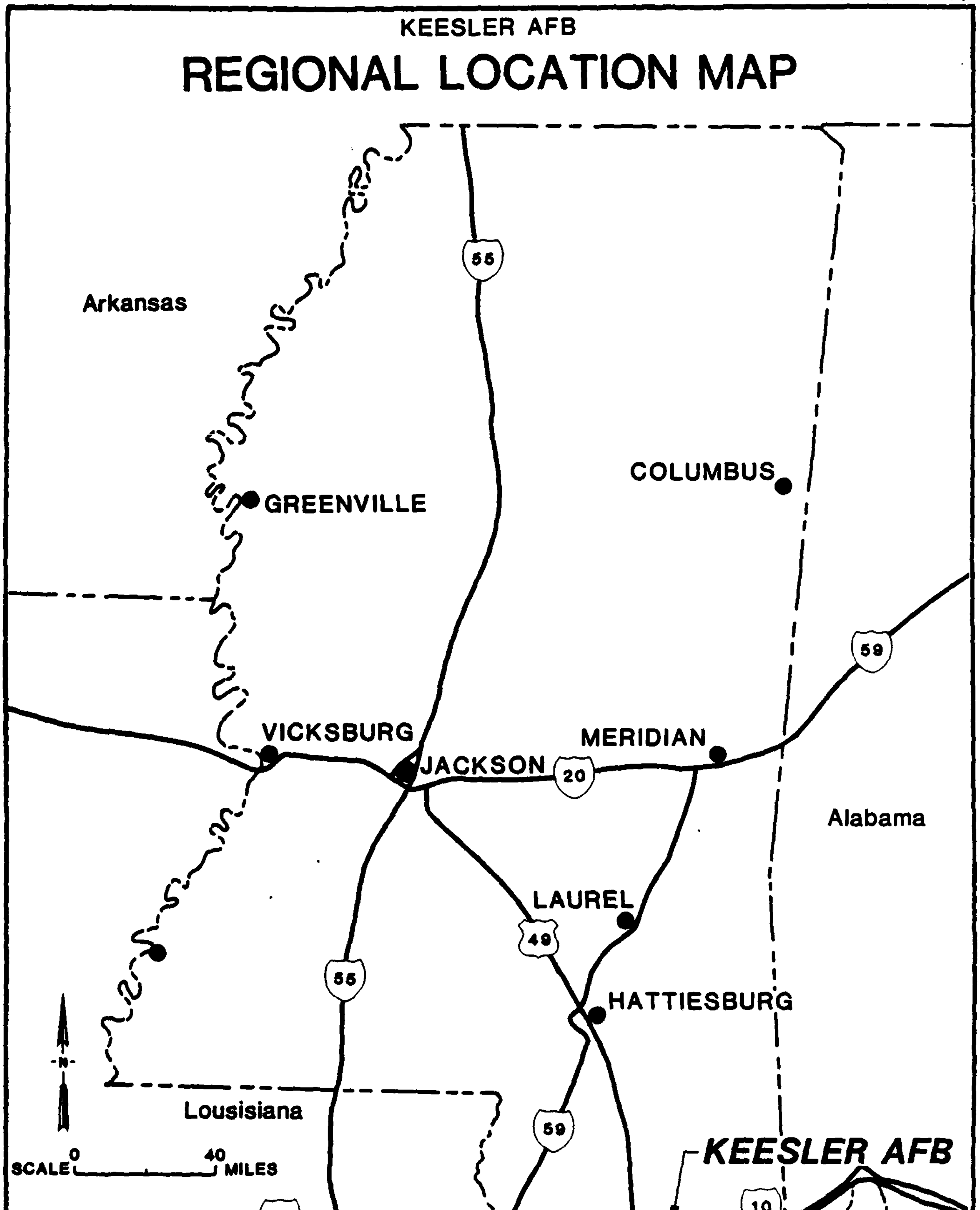
The base comprises 1,494 acres of U.S. government-owned land and 117 acres of leased, permit, and easement lands (see Figures 2.3 and 2.3a). Additional easement property includes a 26-mile long gas pipeline (Figure 2.3b). Two remote installation facilities exist as described below:

- Training Annex No. 1 -- This site consists of 57 acres of U.S. government-owned land approximately two miles west of the main base. The site consists of housing units for base personnel and an abandoned radar station presently used for morale, welfare, and recreation (MWR) activities. The location of this site is shown in Figure 2.3a and the site orientation is shown in Figure 2.4.
- Small Arms Range Annex -- This site consists of 1877 acres (10 acres owned, 1867 acres permit) located twelve miles north-northwest of the base. This site is used for small arms training exercises.

BASE HISTORY

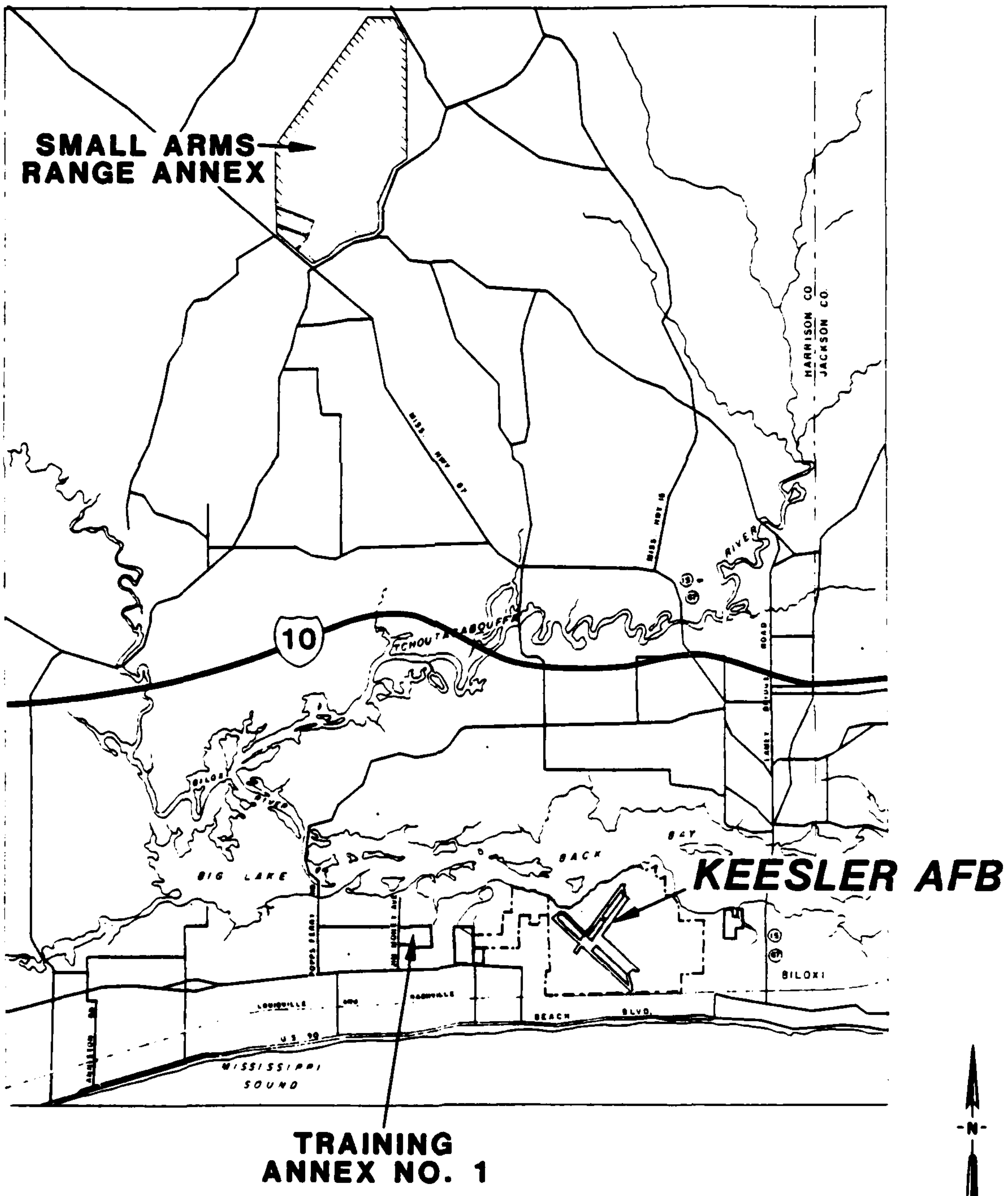
Keesler Air Force Base was activated in June 1941 as a training center for aircraft mechanics. During World War II, the base also

FIGURE 2.1


KEESLER AFB
REGIONAL LOCATION MAP
Arkansas
55
GREENVILLE
COLUMBUS
59
VICKSBURG
JACKSON
20
MERIDIAN
Alabama
LAUREL
49
55
HATTIESBURG
N
Lousisiana
59
SCALE 0 40 MILES
KEESLER AFB
10
12
10
GULFPORT
90
BILOXI
10
SOURCE: ROAD ATLAS
MISSISSIPPI SOUND

KEESLER AFB

AREA LOCATION

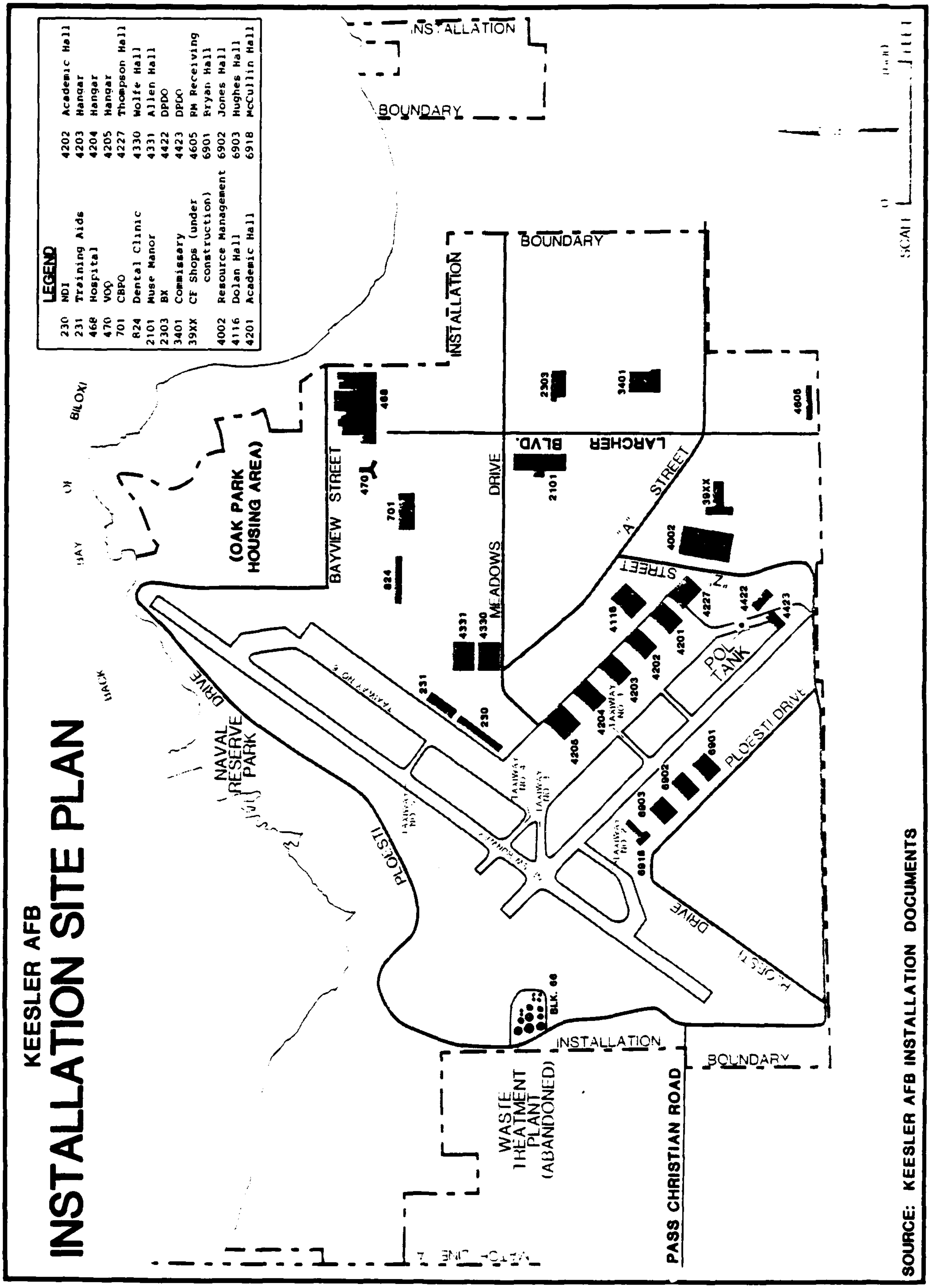


SOURCE: ROAD ATLAS

SCALE 0 2 MILES

ES ENGINEERING-SCIENCE

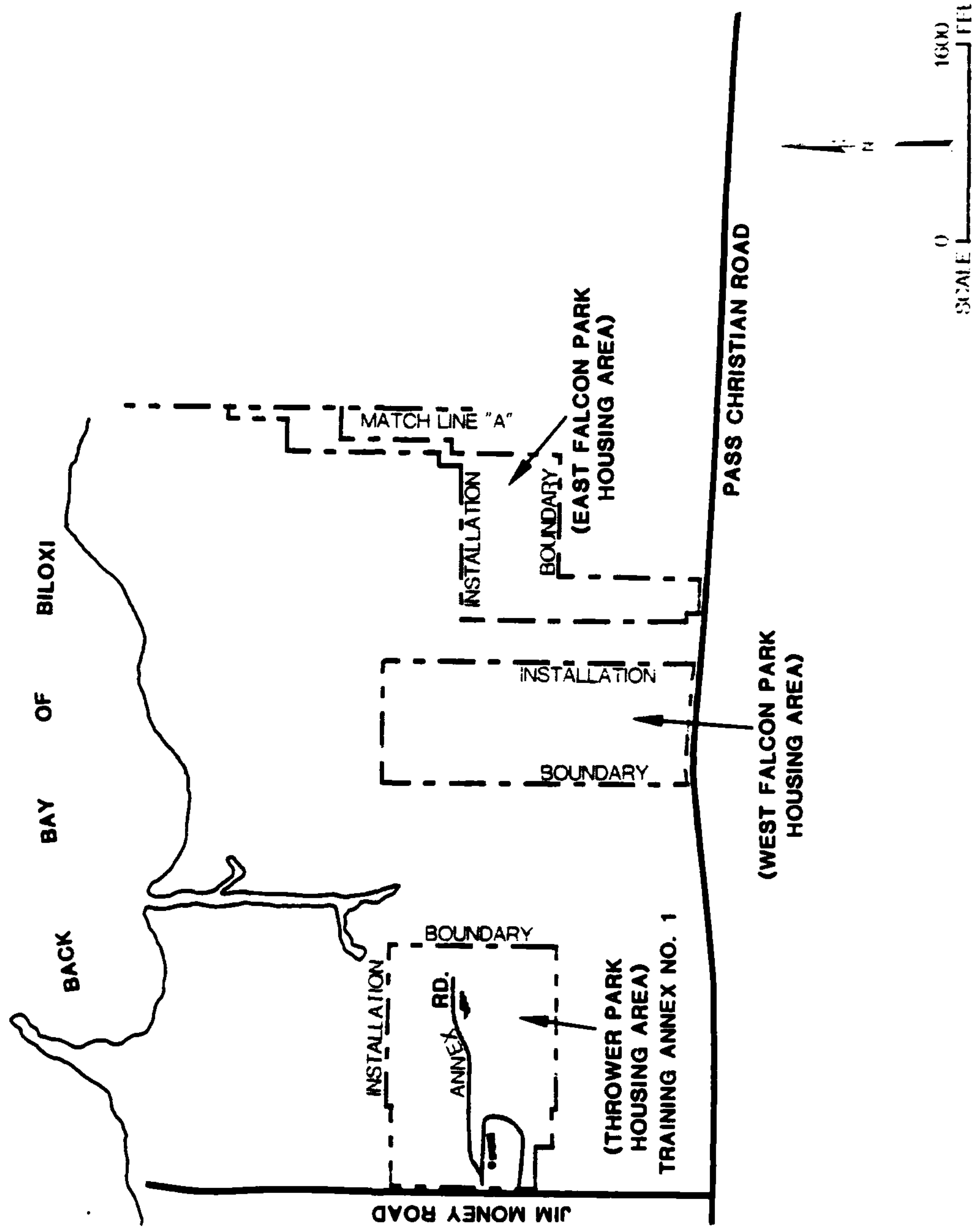
FIGURE 2.3



ES ENGINEERING-SCIENCE

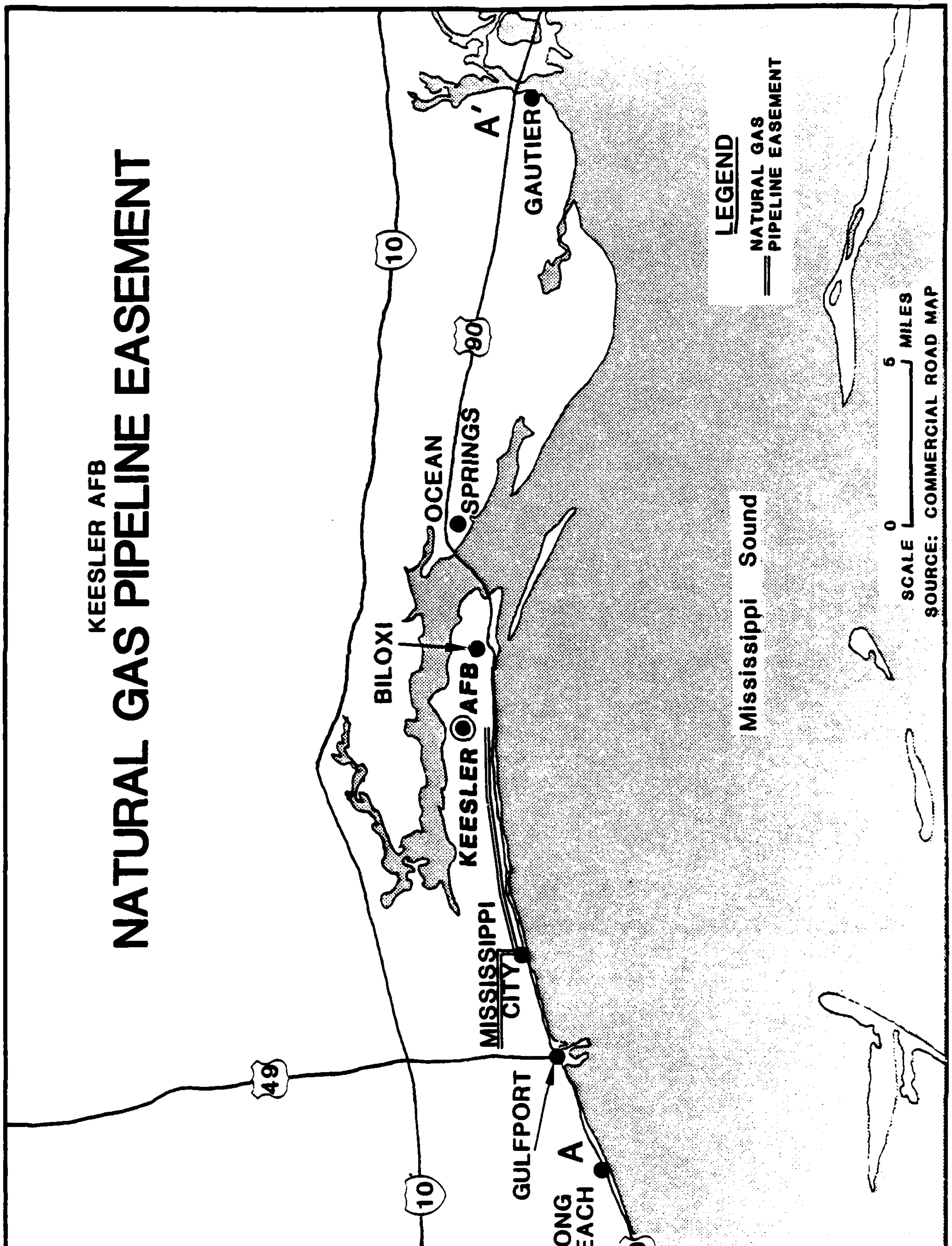
KEESLER AFB

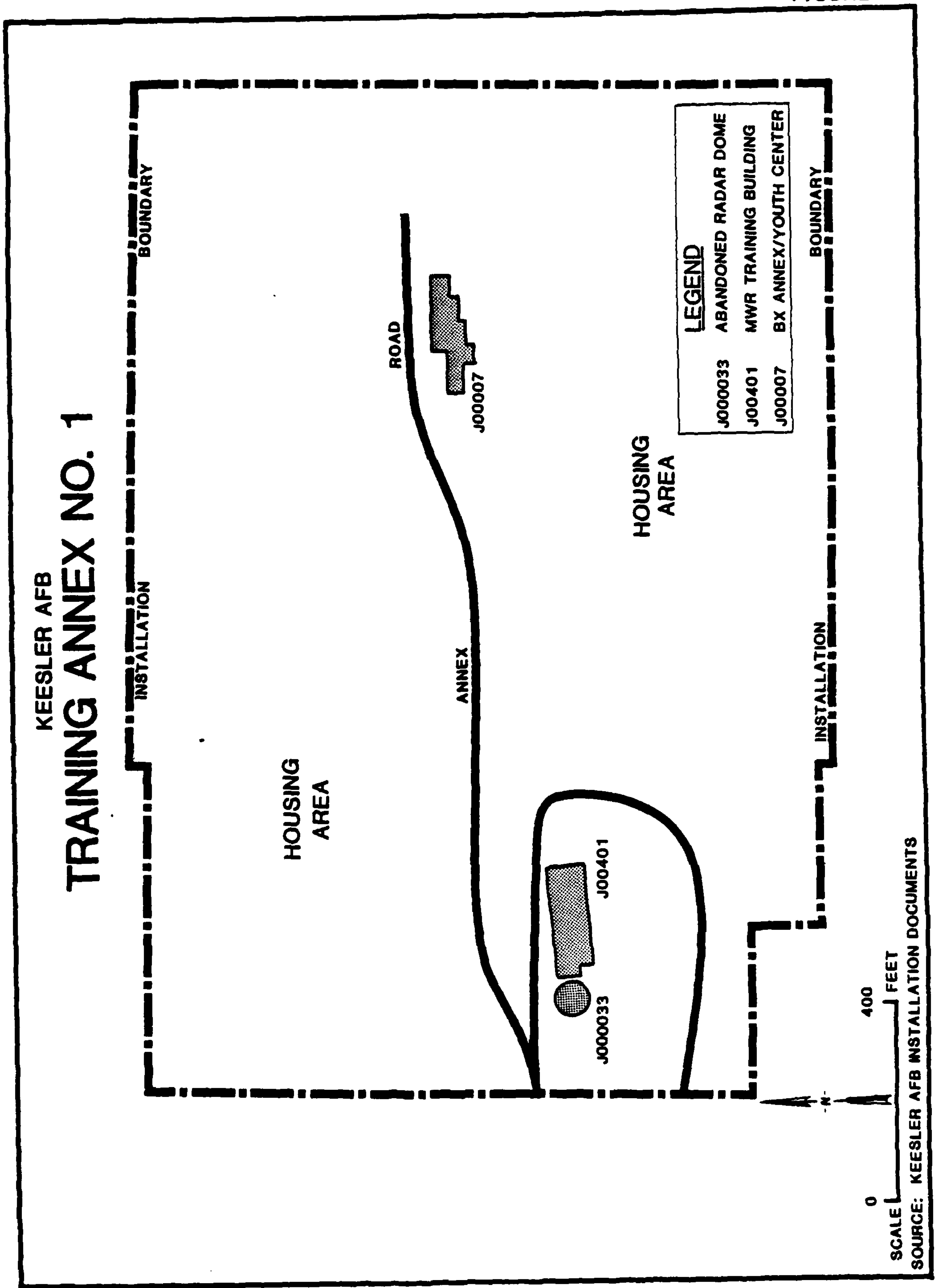
INSTALLATION SITE PLAN (cont'd)



SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

ES ENGINEERING-SCIENCE


KEESLER AFB
NATURAL GAS PIPELINE EASEMENT
LONG BEACH
GULFPORT
A
MISSISSIPPI CITY
KEESLER AFB
BILOXI
OCEAN SPRINGS
GAUTIER
A'
10
49
90
Mississippi Sound
LEGEND
NATURAL GAS PIPELINE EASEMENT
SCALE 0 5 MILES
SOURCE: COMMERCIAL ROAD MAP


KEESLER AFB
TRAINING ANNEX NO. 1
INSTALLATION
BOUNDARY
HOUSING
AREA
ANNEX
ROAD
J00007
J00401
J000033
LEGEND
J000033 ABANDONED RADAR DOME
J00401 MWR TRAINING BUILDING
J00007 BX ANNEX/YOUTH CENTER
N
SCALE
0
400
FEET
SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

operated as a Basic Military Training Center. Keesler was designated a permanent base in October 1945. From the time of its inception, Keesler Air Force Base has been assigned a number of flying missions using a variety of aircraft.

During 1947, the radar training school, the first of numerous electronics training schools, was transferred to Keesler from Boca Raton, Florida. Communications and control courses were transferred to Keesler from Scott Air Force Base, Illinois, in 1958. Personnel and Administrative Career training was transferred from Amarillo AFB, Texas to Keesler AFB in 1968.

In 1967, the USAF Pilot Training School was activated at Keesler. The training program used T-28 aircraft, and operated from 1967 until 1973.

From 1973 to the present, the mission of Keesler AFB has included electronics training and flying operations involving C-130 aircraft. Flying operations since 1973 have included the 403 Reserve Weather Reconnaissance Wing (formerly the 920th Tactical Airlift Group), the 53rd Weather Reconnaissance Squadron (Military Airlift Command), the 7th Airborne Command and Control Squadron, and the First Aerial Cartographic and Geodetic Squadron.

ORGANIZATION AND MISSION

The host unit at Keesler Air Force Base is Headquarters (HQ) Keesler Technical Training Center (KTTC). There are five major units in KTTC; the Deputy Commander for Maintenance, the Deputy Commander for Resource Management, the 3300 Technical Training Wing, the 3380 Air Base Group, and the USAF Medical Center. Each of these units is described briefly in the following discussion.

The Deputy Commander for Maintenance is responsible for maintenance of aircraft and other base equipment. The 3380 Avionics Maintenance Squadron and the 3380 Organizational Maintenance Squadron comprise the major parts of the Deputy Command for Maintenance. The Deputy Commander for Resource Management is responsible for supply and transportation activities at the base. The 3300 Technical Training Wing serves as the instruction unit for training courses. The 3380 Air Base Group is responsible for administration, personnel, base operations, civil engineering, and security. The USAF Medical Center provides health care services to active and retired military personnel in the southeastern United States.

Staff and support groups in KTTC include the Inspector General, Social Actions, Staff Judge Advocate, Safety, Programs, Public Affairs, and the 502 Air Force Band.

The major tenant organizations at Keesler Air Force Base are listed below. Descriptions of the major tenant organizations and their missions are presented in Appendix C.

- 7th Airborne Communications and Control Squadron (TAC)
- 403 Reserve Weather Reconnaissance Wing (AFRES)
- 53rd Weather Reconnaissance Squadron (MAC)
- 1839th Electronics Installation Group
- 2052 Communications Squadron
- Detachment 22, 24th Weather Squadron (MAC)
- AF Audit Agency
- 3314 Management Engineering Detachment 2
- Det 812 Air Force Office of Special Investigation
- USAFSS Liaison Office
- Field Training Detachment 318
- Defense Property Disposal Office
- HQ, Air Weather Service (MAC), Detachment 5
- 375 Aeromedical Airlift Wing, Detachment 2
- Air Force Commissary, Detachment 8
- Liaison Office, 23rd Air Defense Group
- Liaison Office, 6960 ESW
- Liaison Office, MACOS
- American Red Cross

SECTION 3
ENVIRONMENTAL SETTING

The environmental setting of Keesler Air Force Base is described in this section with an emphasis on the identification of natural features that may promote the movement of hazardous waste contaminants. Environmental conditions pertinent to the study are summarized at the conclusion of this section.

CLIMATE

The climate of the Biloxi area is described as humid subtropical. Monthly rainfall is normally distributed evenly throughout the year. Selected meteorological data for Keesler AFB are summarized in Table 3.1.

Two climatic features of interest in determining the potential for the movement of contaminants are net precipitation and rainfall intensity. Net precipitation is an indicator of the potential for leachate generation and is equal to the difference between precipitation and evaporation. Rainfall intensity is an indicator of the potential for excessive runoff and erosion. The one-year, 24-hour rainfall event is used to gauge the potential for runoff or erosion and is reported to be 10.2 inches. The mean annual precipitation at the base for the period 1942 to 1981 is 61.3 inches (Keesler AFB Documents) and the mean annual lake evaporation for the area is 48 inches (NOAA, 1977). Net precipitation at Keesler AFB is 13.3 inches as determined from these meteorological data. This substantial net precipitation figure indicates that the potential for rainfall to infiltrate surface soils exists. The high one-year, 24-hour rainfall number indicates a strong potential for runoff and soil erosion.

TABLE 3.1
KEESLER AFB CLIMATIC CONDITIONS

MONTH	Temperature (°F)					Precipitation (In)				Snowfall (In)		
	Mean			Extreme		Monthly			Max	Monthly		Max
	Daily		Monthly									
	Max	Min		Max	Min	Mean	Max	Min	24 Hrs	Mean	Max	24 Hrs
JAN	60	44	52	80	10	4.7	11.8	#	6.5	0	#	#
FEB	62	47	55	80	15	4.2	11.8	.2	4.3	0	3	2
MAR	68	53	61	90	24	6.7	17.1	#	5.7	#	1	1
APR	76	62	69	93	39	4.9	16.7	#	7.0	0	0	0
MAY	83	68	76	97	48	4.7	12.3	.1	5.7	0	0	2
JUN	88	74	81	101	57	5.2	14.2	#	5.4	0	0	0
JUL	90	76	83	101	60	7.1	25.2	.4	6.5	0	0	0
AUG	90	75	83	104	62	6.1	12.4	.2	3.6	0	0	0
SEP	86	72	79	98	45	7.0	18.7	.0	10.2	0	0	0
OCT	79	61	70	93	36	2.4	10.6	.0	3.0	0	0	0
NOV	69	51	60	85	25	3.7	11.1	#	5.0	0	0	0
DEC	62	46	54	81	12	4.6	8.8	.1	3.0	#	8	8
ANN	-	-	69	-	-	61.3	-	-	-	-	-	-
EYR	39	39	39	39	39	39	39	39	39	32	32	32

SOURCE: Detachment 22, 24th Weather Squadron, Keesler AFB, MS.

Note: # indicates trace accumulations.

EYR - Years of record.
ANN - Annual average.

Period of Record, 1942-1981

GEOGRAPHY

The study area lies in the East Gulf subdivision of the Coastal Plain physiographic province (Fenneman, 1930). The East Gulf is described as a broad zone of young to mature belted coastal plains. The immediate study area consists of an eastward-extending peninsula characterized by beaches and dunes, marine estuaries, tidal flats and low terraces. Locally, the land surface appears generally level, without spatial variation.

Topography

Local relief is primarily the result of past depositional and more recent erosional processes. The peninsula has developed conspicuous raised areas separated by subparallel drainage alignments ("drains"). Typically, elevations are less than 40 feet Mean Sea Level (MSL). Installation elevations range from 31.5 feet MSL at the base golf course to less than 5 feet MSL along the Back Bay of Biloxi shoreline. Relief is generally low for much of the base and is most notable near the Naval Reserve area where land surface gently grades toward the Bay (from Base Comprehensive Plan, Tab C-1, two pages, dated 1 October 1979).

Drainage

The drainage of installation land areas is accomplished by overland flow, open channels, and covered drainage culverts to area surface waters. Most of the main installation drainage is directed to the Back Bay. Limited amounts of drainage from the Triangle Area at the southwest corner and the southeast corner of the base are directed to City of Biloxi storm sewers, which in turn drain to Mississippi Sound. The Harrison Court housing area drains to Keegan Bayou which flows to the Back Bay. The Bay Ridge housing area drainage is divided between direct discharge to the Back Bay and to an unnamed tributary of Bayou La Porte. The East Falcon Park, West Falcon Park and the Thrower Park housing areas also drain to unnamed tributaries of Bayou La Porte.

Flooding has been identified as a major problem along much of the Mississippi-Gulf coastal area. Base documents indicate that significant portions of the installation could become inundated during 100-year and 500-year flood events. Base drainage features and areas subject to flooding are depicted on Figures 3.1 and 3.1a.

FIGURE 3.1

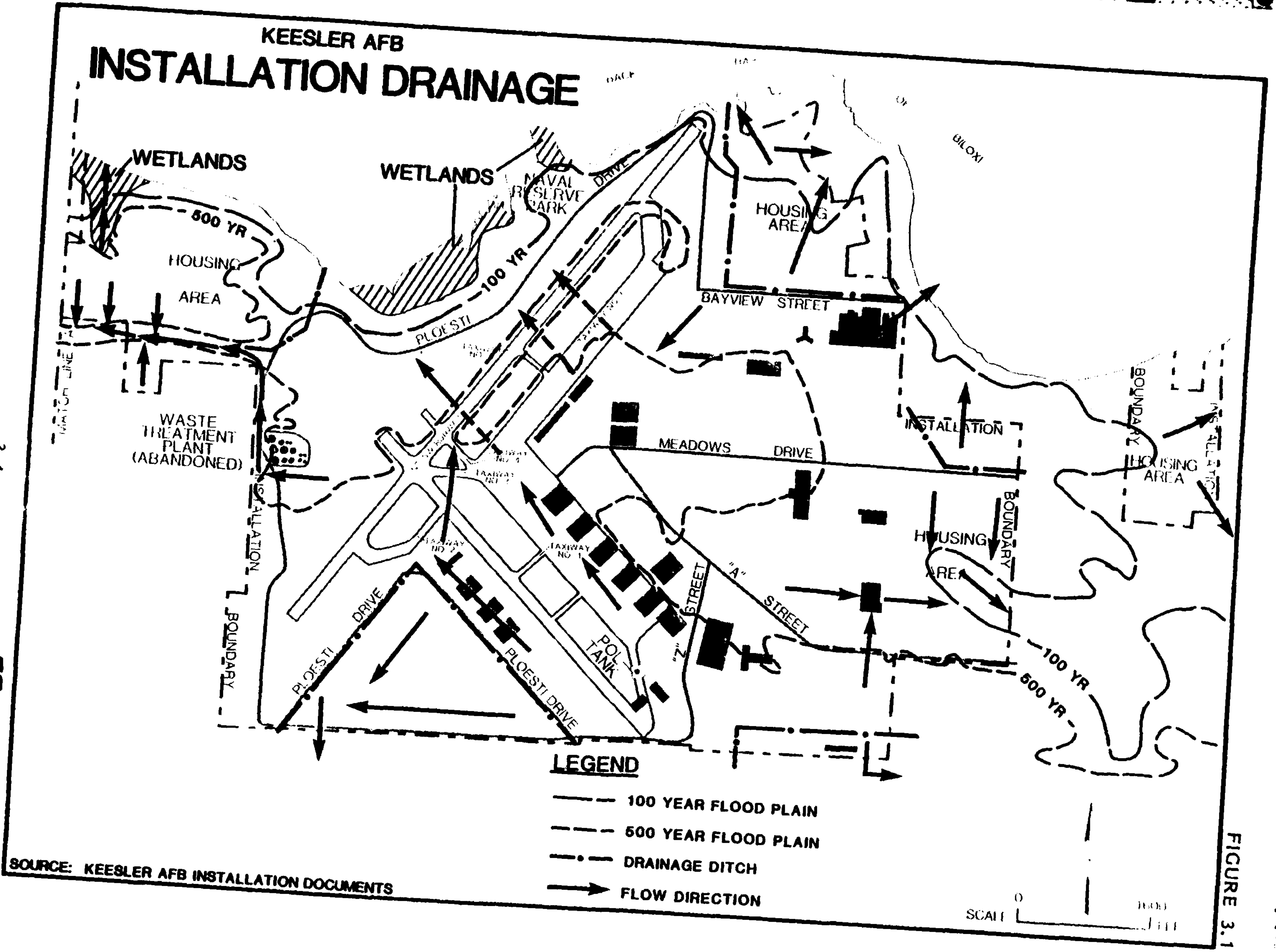
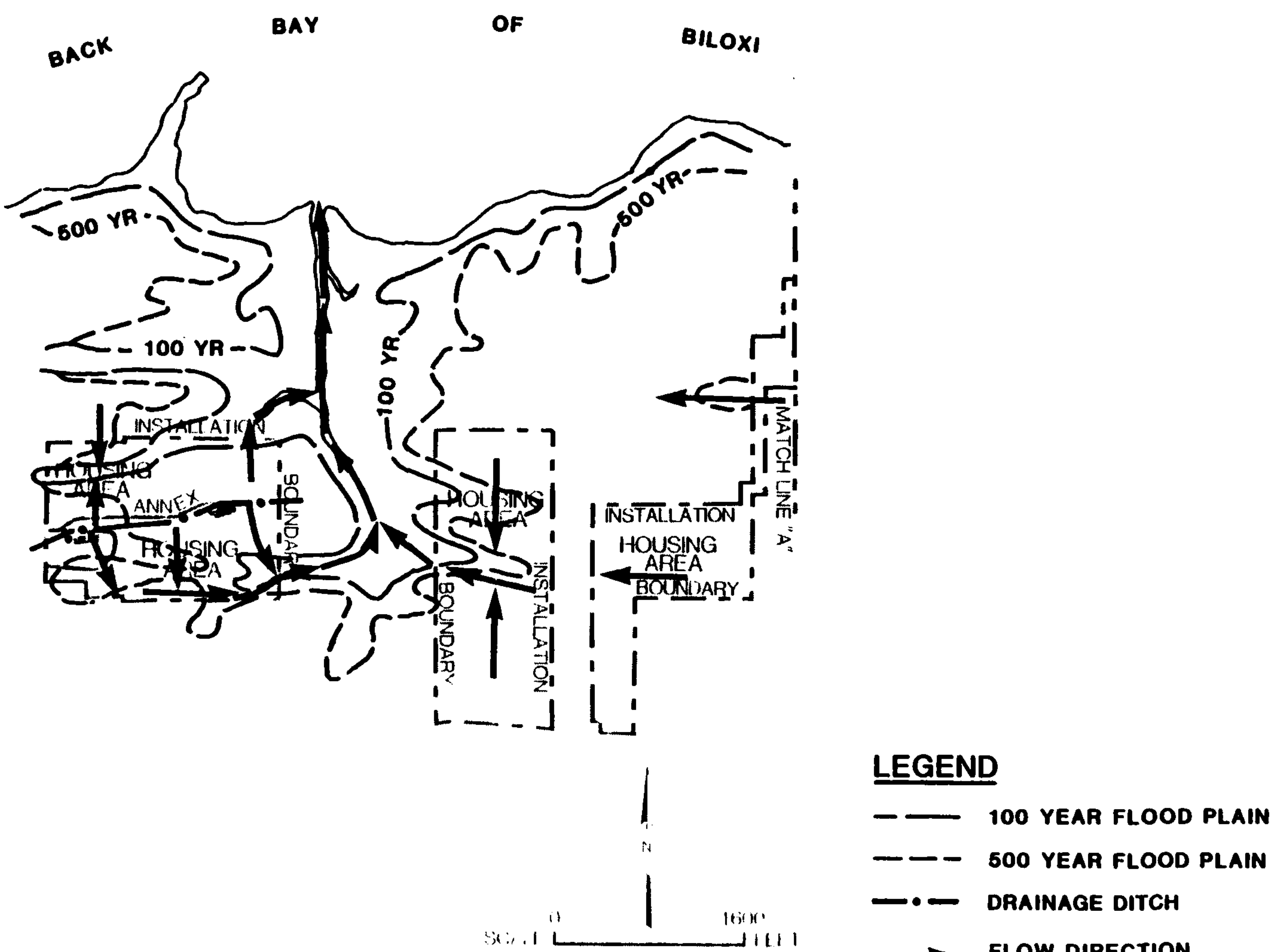

KEESLER AFB
INSTALLATION DRAINAGE
WETLANDS
WETLANDS
NAVAL RESERVE PARK
500 YR
100 YR
HOUSING AREA
HOUSING AREA
HOUSING AREA
HOUSING AREA
WASTE TREATMENT PLANT (ABANDONED)
PLOESTI
PLOESTI DRIVE
PLOESTI DRIVE
DRIVE
BAYVIEW STREET
MEADOWS DRIVE
"A" STREET
"Z" STREET
POL TANK
TAXIWAY NO 1
TAXIWAY NO 2
INSTALLATION BOUNDARY
INSTALLATION
BOUNDARY
BILOXI
100 YR
500 YR
LEGEND
100 YEAR FLOOD PLAIN
500 YEAR FLOOD PLAIN
DRAINAGE DITCH
FLOW DIRECTION
SCALE
0
SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

FIGURE 3.1A

KEESLER AFB

INSTALLATION DRAINAGE (cont'd)



SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

Surface Soils

Surface soils of Harrison County, Mississippi, have been described in a report published by the USDA, Soil Conservation Service (1975). Modern soils found within the study area have formed over Holocene (recent) coastal deposits which are the predominantly sandy remnants of old beaches. Most installation soils are sandy, well to excessively well drained, permeable and possess high water tables (generally within six feet of ground surface). According to the Soil Conservation Service guidelines, all of the soil units mapped on Air Force property exhibit moderate to severe limitations for the development of disposal facilities, due to high water tables, permeability or susceptibility to flooding. Table 3.2 summarizes the principal characteristics of the nine soil units mapped on installation lands. The distribution of these units is depicted on Figure 3.2 and Figure 3.2a.

GEOLOGY

Information describing the geologic setting of Keesler Air Force Base has been obtained from Brown, et al., (1944); Newcome, et al., (1968); Bicker (1969); and Wasson (1980). Additional information has been obtained from interviews with U.S. Geological Survey personnel.

Stratigraphy

Geologic units ranging in age from Miocene to Recent have been identified in the project area. These units are typically unconsolidated materials consisting of gravel, sand, silt, and clay. Although the units may be somewhat similar in character, they can usually be differentiated by variations in mineralogy, macro- and micro-structure, color (related to depositional environment), fossils and grain size. Table 3.3 summarizes Coastal Plain geologic formations and describes their significant characteristics, in chronological sequence.

Distribution

The significant geologic units present in the study area include the Coastal Deposits (mapped as "Pamlico Sand" by Brown, et al., 1944 and as "Coastal Deposits" by Bicker, 1969) which occur at ground surface, underlain in turn by the Citronelle, Graham Ferry and Pascagoula Formations. Generally, the geology of Keesler Air Force Base is dominated by moderately thick sections of unconsolidated deposits. These

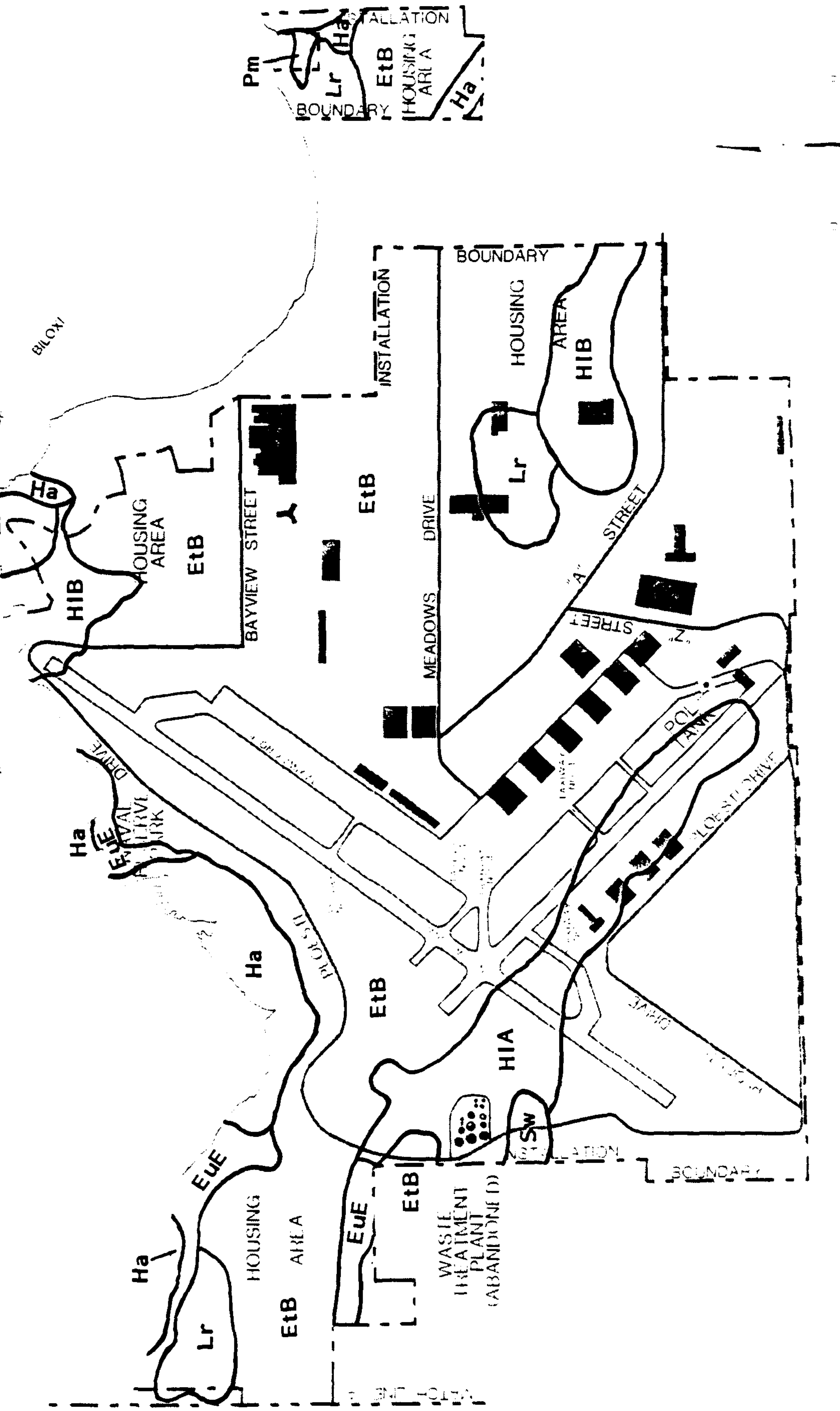
TABLE 3.2
KEESLER AIR FORCE BASE SOILS

Map Symbol	Unit Description	USDA Texture (Major Fraction)	Thickness (Inches)	Unified Classification (Major Fraction)	Unit Permeability* (Inches/hour)	Depth to Seasonal High Water Table, ** in.	Disposal Facility Use Constraints (SCS Estimate)
E+B	Eustis loamy sand, 0-5% slopes	Loamy sand	83	SM	2.0-6.3	60-120	Moderate - permeability, water table depth
EuE	Eustis and Porach soils, 8-17% slopes	Fine sandy loam, sandy clay loam, loamy sand	84	SM, ML, SC, CL	0.2-2.0	>50	Moderate - peremeability, water table depth
Ha	Handsboro Association	Organic soils, loam	60	PT	0.63-2.0	At surface	Severe - Subject to tidal flooding
HlA	Harleston sandy loam, 0-2% slopes	Fine sandy loam, sandy clay loam	98	ML, SM, SC, CL	0.63-2.0	18-24	Severe - High water table
HlB	Harleston sandy loam, 25% slopes	Fine sandy loam, sandy clay loam	98	ML, SM, SC, CL	0.63-2.0	18-24	Severe - High water table
Lr	Lakeland sand	Fine sand, sand	72	SP-SM, SP	6.3-20.0	60-120	Severe - Permeability
Pm	Plummer loamy sand	Loamy sand, sandy loam	72	SM	0.63-20.0	0-15	Severe - Flooding, permeability
Ps	Ponzer and Smithton Soils	Organic soils, fine sandy loam, sandy loam, loam	60-72	PT, SM, SM-SC, ML, CL	0.2-2.0	0-15	Severe - Flooding
Sw	Sulfaquepts (hydraulic fill)	Sand	50	SP-SM	6.3-20.0	15-30	Severe - Peremeability, high water table

Source: USDA, Soil Conservation Service, 1975

*: Although called "permeability" this usage suggests the infiltration rate.
**: Minimum seasonal depth to water table, measured from ground surface, in inches.

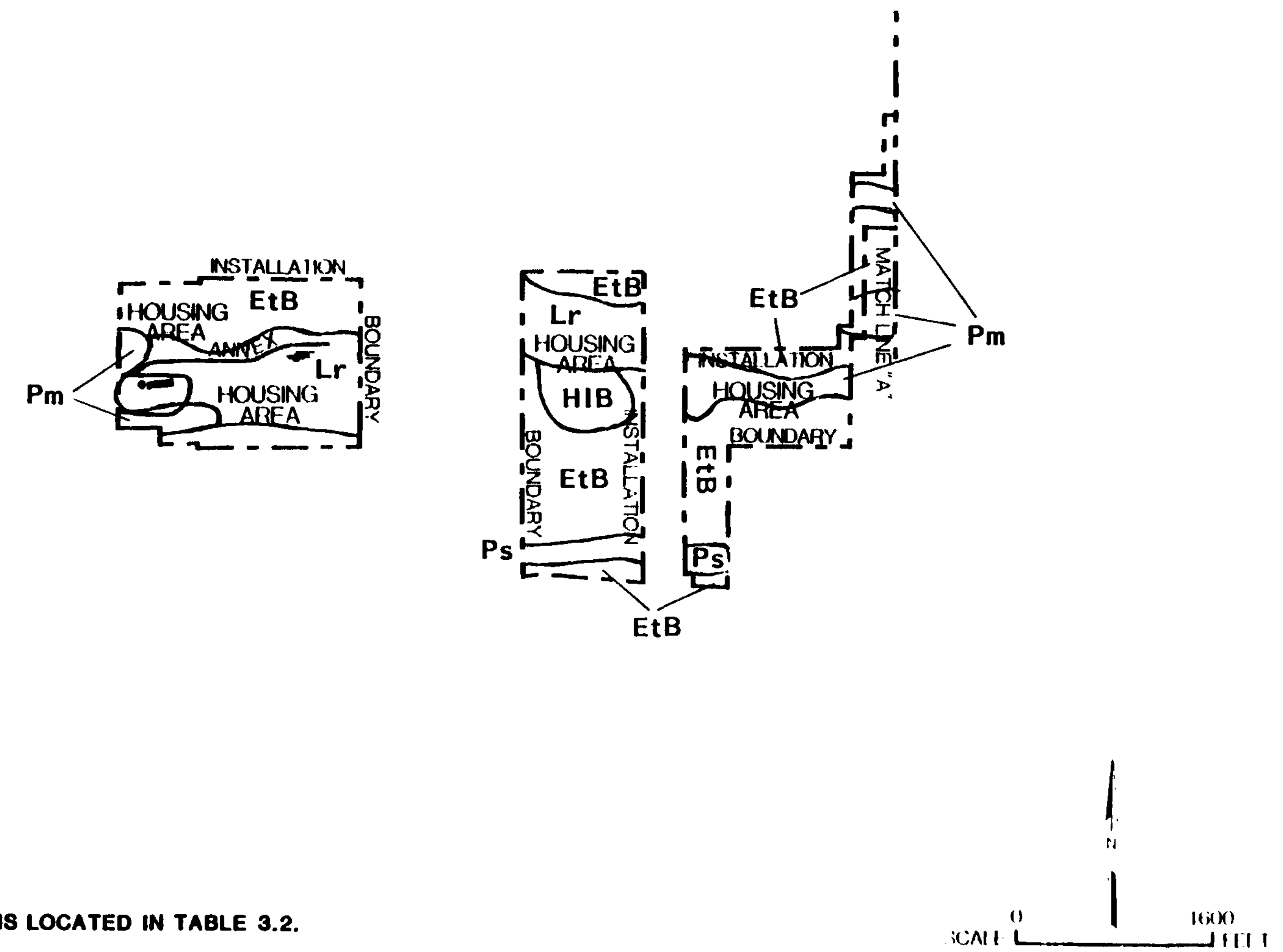
KEESLER AFB
INSTALLATION SOILS



NOTE: SOIL UNIT DESCRIPTIONS LOCATED IN TABLE 3.2.
SOURCE: SMITH, 1975

KEESLER AFB

INSTALLATION SOILS (cont'd)



NOTE: SOIL UNIT DESCRIPTIONS LOCATED IN TABLE 3.2.
SOURCE: SMITH, 1975

TABLE 3.3
MISSISSIPPI COASTAL PLAIN GEOLOGIC FORMATIONS

Series	Formation	Known Thickness (feet)	Physical Character	Hydrologic Properties
Pleistocene and Recent	Alluvium	0-80	Chert and quartz gravels and sands grading up into sandy clays and silt. Much organic debris including sawdust near and in the tidal marshes.	Contains large undeveloped supplies especially attractive because of uniform low temperature (70°F) throughout the year. The southernmost portions of the Pascagoula River alluvium are known to contain salty water, and the other estuaries are probably similar; consequently large developments should be located with care.
	Coastal Deposits	1-75	Mostly unconsolidated gray and tan sand; locally contains pebbles of quartz and chert and, in former lagoonal areas, much clay and silt.	Contains much water in the beach areas under water-table conditions and in contact with salt water. In many places the supply has been contaminated with sewage, but would be suitable for air-conditioning if salt-water connection is considered.
	Low Terrace Deposits	0-20	Sand derived from beach deposits, locally sprinkled with pebbles of quartz and brown chert.	Insufficient thickness and areal extent to yield other than small shallow wells for domestic and stock consumption.
	High Terrace Deposits	0-100	Sand and gravel wherein quartz is more abundant and chert less abundant than in the older adjacent Citronelle formation; locally an iron-cemented conglomerate at the base.	Small farm supplies are derived from the High Terrace Deposits. The elevated position facilitates drainage through springs and effluent seepage, so that only the lower few feet are saturated.
Pliocene and Pleistocene	Citronelle Formation	0-100	Brick-red sand and gravelly sand; the pebbles are mostly brown chert and milky quartz; generally cross-bedded, and, in the lower part, contain thin beds and pockets of gray clay and clayey gravel.	Numerous small farm supplies derived from a few feet of saturated sand and gravel in the lower part of the formation. Salt-water encroachment ruined a supply at Moss Point which probably came from a finger of the Citronelle gravel.
	Graham Ferry Formation	0-200	Silty clay and shale, sand, silty sand, and gravelly sand and gravel in heterogeneous deltaic masses; various colors, generally dark; carbonaceous clay most abundant in the outcrops; marine fossil casts in the upper beds are common.	The most intensively developed formation, containing water under artesian pressure throughout southern part of the area. Most water for war purposes has come from the Graham Ferry, and there is no evidence of excessive development.
	Pascagoula Formation	0-1000	Clay and shale, generally blue-green, silt, sandy shale, gray and green sand, gray silty clay, and dark sandy gravel containing numerous grains and pebbles of polished black chert; of estuarine or deltaic origin; identified for the most part by a brackish water clam, Rangia johnsoni.	About 40% of water produced in the coastal area has come from artesian sources within the Pascagoula formation. The eastern part, Jackson and eastern Harrison Counties, contains some brackish water, the salt content increasing with depth and towards the east.
Miocene	Hattiesburg Formation	0-400	Gray-green and blue-green shale and clay, gray sand and silt, mostly carbonaceous and noncalcareous--of a more continental origin than overlying beds.	Undeveloped supplies along the crest of the Wiggins-Lucedale anticline in the northern part of the area. The remainder of the formation contains brackish or salt water.
	Catahoula Sandstone above Heterostegina Zone	500-900	Shale, sandy shale, sand, clay and silt, and gravelly sands containing black chert.	The uppermost Catahoula sandstone contains fresh water on the crest of the Wiggins-Lucedale anticline, according to electrical logs of oil prospect wells. Undeveloped in the coastal area.

Source: Modified from Brown, et al., 1944 and Shows, 1970.

deposits are typically interlayered sequences of sands, gravels and clays. Usually, stratification of the individual units is apparent due to sorting by grain size; however, they are not normally correlative over long distances. The thick sand beds occurring in each of the major formations tend to be lenticular sand and gravel deposits separated by moderately thick, but discontinuous clay layers (Shows, 1970). The distribution of study area geologic units is shown on Figure 3.3.

The shallow geologic unit, the Coastal Deposits, have been investigated at Keesler AFB by shallow soil test borings, drilled for preconstruction design purposes. Figures 3.4 and 3.5 are presented as representative examples of installation subsurface conditions. The unconsolidated materials encountered by the test borings are typically loose to very dense sands, occasionally separated by clays, usually at depths in excess of 20 feet. Ground water was encountered at shallow depths in the sands (less than 10 feet below ground surface) in virtually all of the approximately 60 test boring logs examined for this study.

Structure

Sediments of the Coastal Plain form a southerly dipping wedge, with a point of origin (Fall Line) at the northeast corner of Mississippi and thicken seaward. Sediment thickness at the Fall Line is measured in inches. At the termination of the Mississippi River, however, the total sediment accumulation probably exceeds 30,000 feet (Newcome, et al., 1968). The Gulf area continues to receive large quantities of sediments in what is actually a geosyncline, a large sinking trough.

Individual geologic units comprising the Coastal Plain formations also tend to dip and thicken seaward as does the total accumulation. The dip rate measured in the Citronelle Formation ranges from 6 to 25 feet per mile, which is considered to be a relatively gentle gradient. The geologic units present in the study area are not known to be disrupted by faulting or other geologic discontinuities. However, changes in past depositional or erosional events may cause some isolated beds to occur at steeply dipping angles or to be replaced abruptly on a local scale. Figure 3.6 is a generalized subsurface section of the Mississippi Coastal Plain, drawn parallel to the dip (north to south), depicting the relationships of the major geologic units present.

FIGURE 3.3

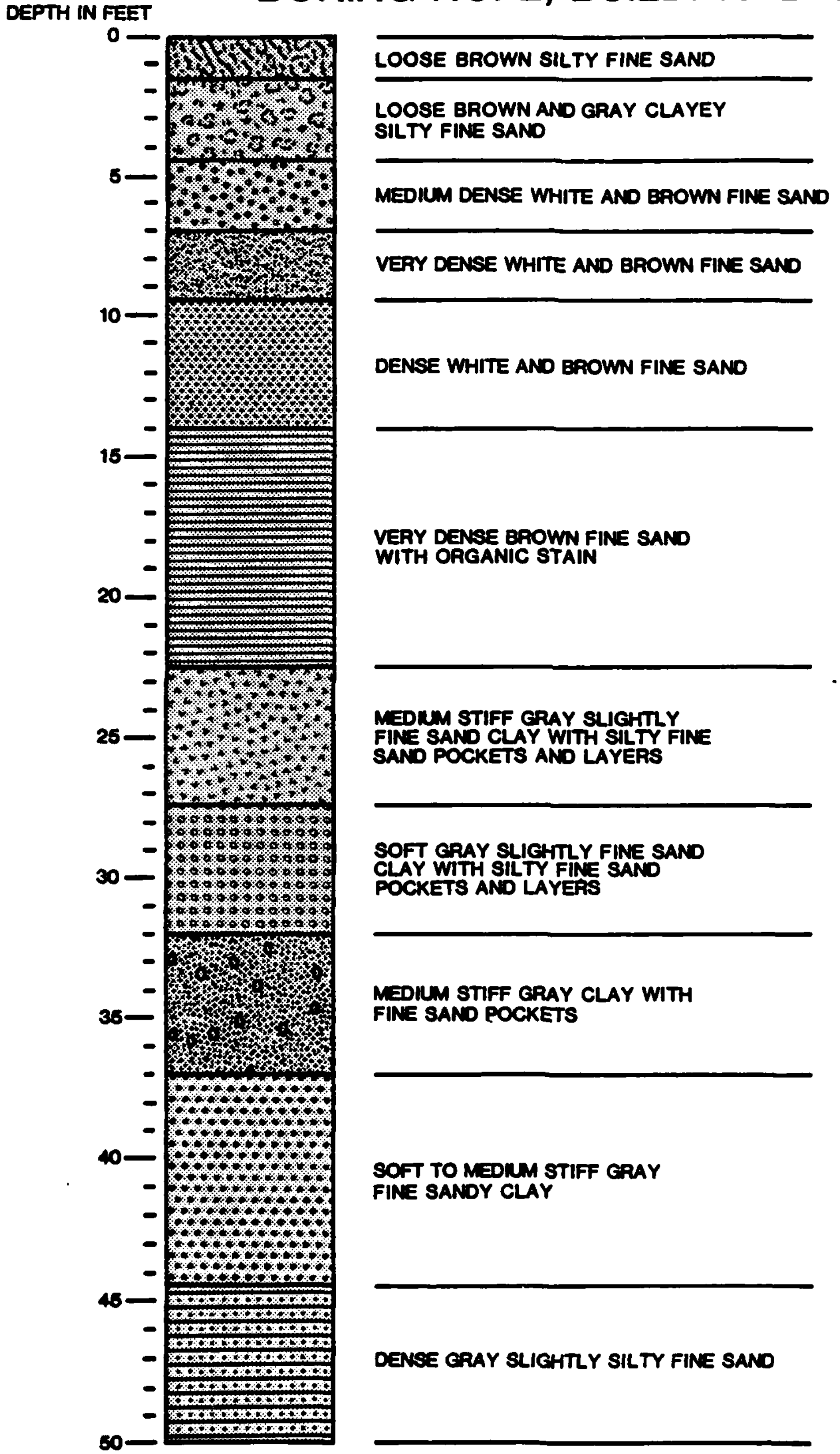
KEESLER AFB
STUDY AREA GEOLOGIC MAP

FIGURE 3.4

KEESLER AFB

LOG OF INSTALLATION TEST BORING

BORING NO. 2, BUILDING 2101



SOURCE: KEESLER AFB INSTALLATION DOCUMENTS ; JANUARY 30, 1974 NOTE: ENCOUNTERED WATER AT 7 FEET.

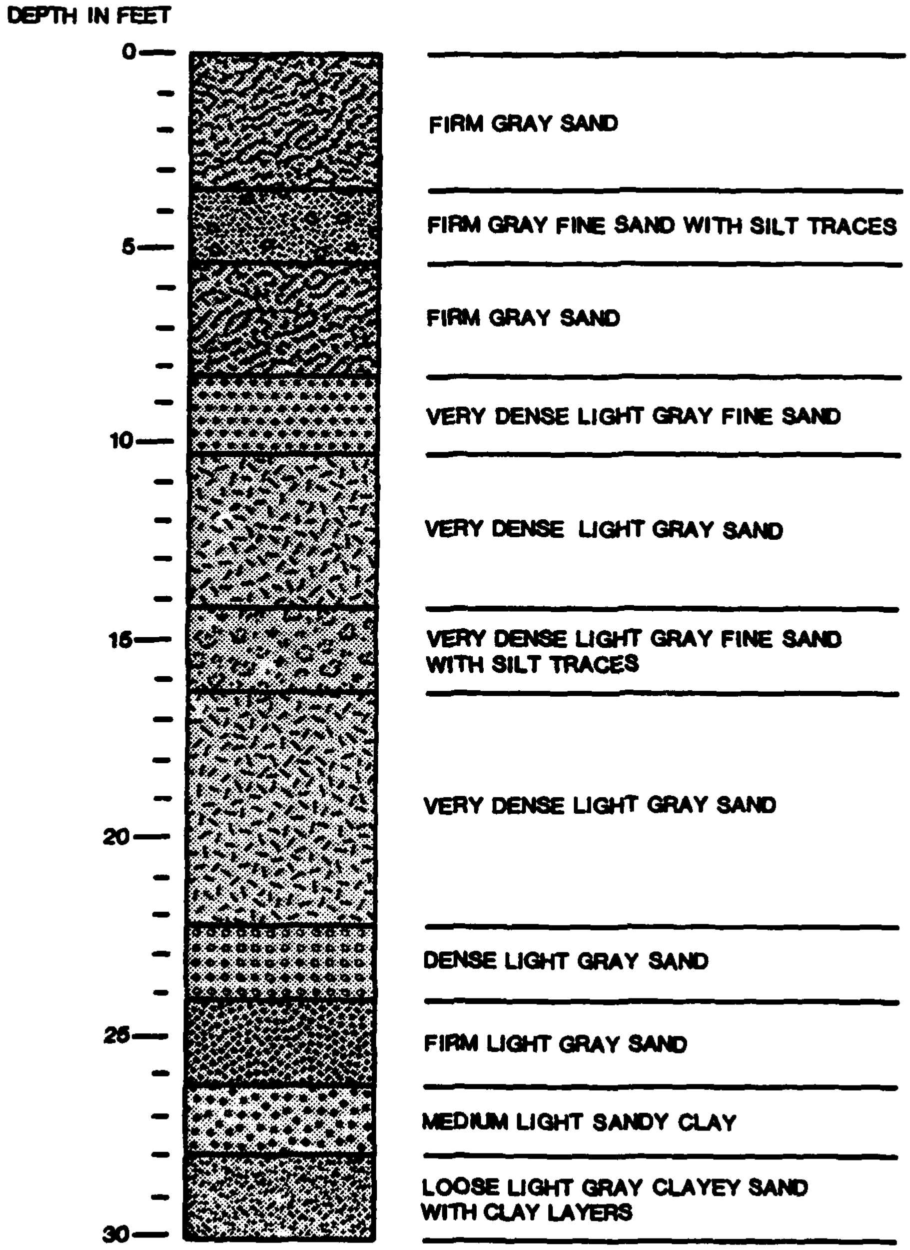
ES ENGINEERING-SCIENCE

FIGURE 3.5

KEESLER AFB

LOG OF INSTALLATION TEST BORING

BORING NO. 1, BUILDING 4205



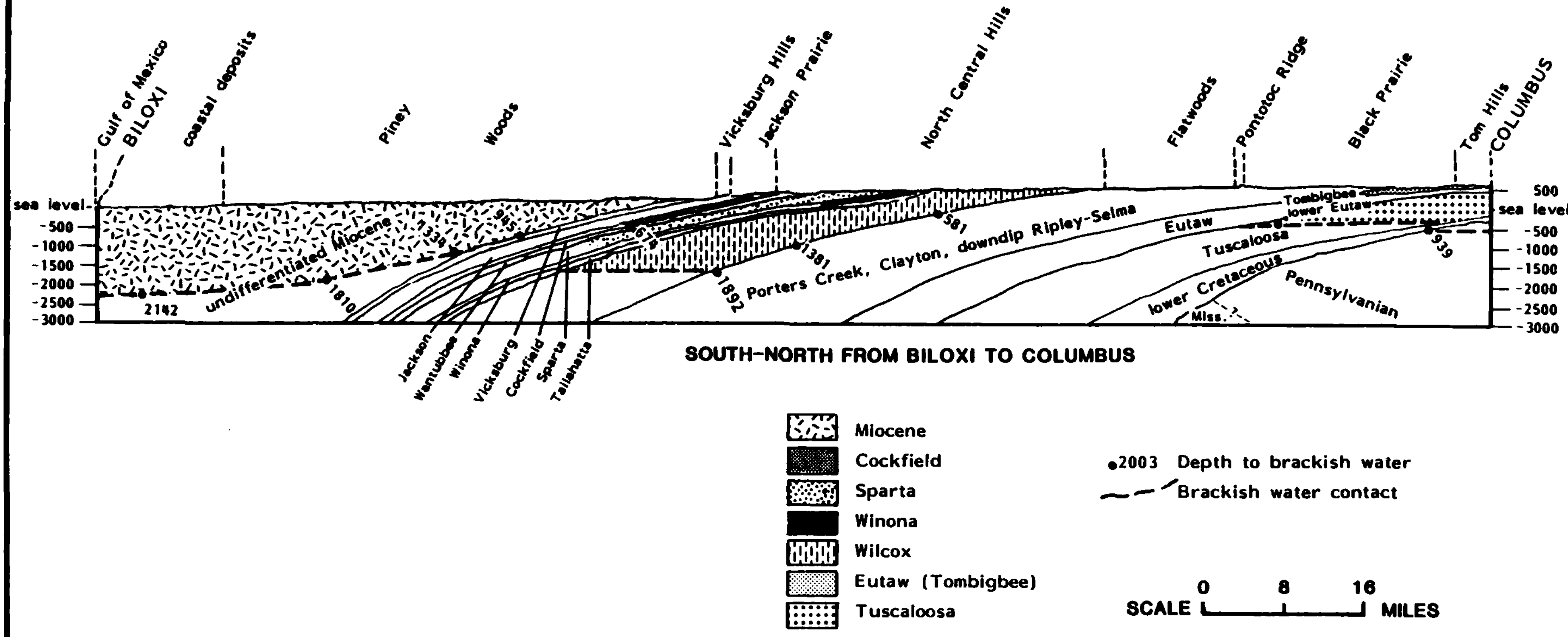
NOTE: ENCOUNTERED WATER AT 8 FEET.

SOURCE: KEESLER AFB INSTALLATION DOCUMENTS; FEBRUARY 20, 1974

FIGURE 3.6

KEESLER AFB

GENERALIZED GEOLOGIC SECTION OF THE MISSISSIPPI COASTAL PLAIN



SOURCE: PRIDDY, 1955

GROUND-WATER RESOURCES

Project area ground-water resources have been described by Lusk (1953); Priddy (1955); Newcome, et al., (1968); Shows (1970) and Wasson (1980). Additional information has been obtained from interviews with U.S. Geological Survey-Water Resources Division and Mississippi Geological Survey Personnel.

Study Area Hydrogeologic Units

Keesler Air Force Base lies within the outer coastal area of Mississippi. In this area, several major hydrogeologic units have been identified, which are listed in Table 3.3 (page 3.10) and shown in a hydrogeologic cross section, Figures 3.7 and 3.7A. The units of particular interest to this investigation are as follows:

- o Coastal Deposits
- o Citronelle Formation
- o Miocene System (Graham Ferry, Pascagoula, Hattiesburg and Catahoula Formations)

The coastal deposits consist of fine to medium sands, silts and clays, variously layered or intermixed in a stratum estimated to vary in thickness from one to 75 feet. This unit occurs at ground surface. According to the log of Base Well No. 2 (Figure 3.8) (interpreted by Brown, et al., 1944), the coastal deposits are about 20 feet thick at the base. In the vicinity of Keesler Air Force Base, ground water occurs at shallow depths (usually less than 10 feet from ground surface) according to installation test borings and Stover (1984), and is present under water table (unconfined) conditions. Test boring information suggests that the unit is sandy and moderately permeable from ground surface to normal static water levels. Recharge of the coastal deposits occurs primarily by precipitation falling on exposed portions of the unit. Most of Keesler AFB is probably located in a recharge area of the coastal deposits. Ground-water flow is directed toward zones of decreasing hydraulic head, in this situation, most likely to area surface waters or to underlying hydrogeologic units. Actual ground-water flow directions within this unit are uncertain.

FIGURE 3.7

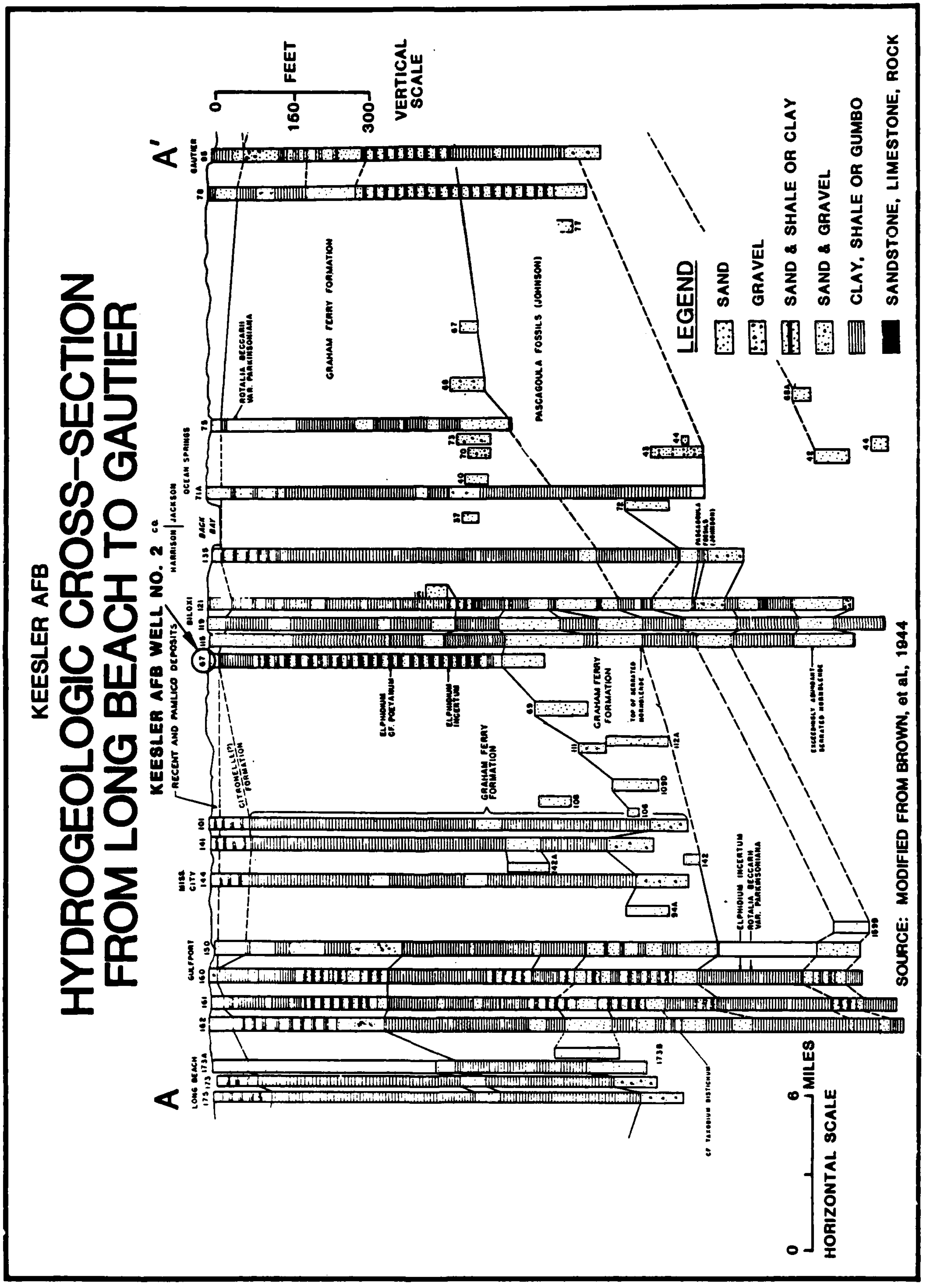
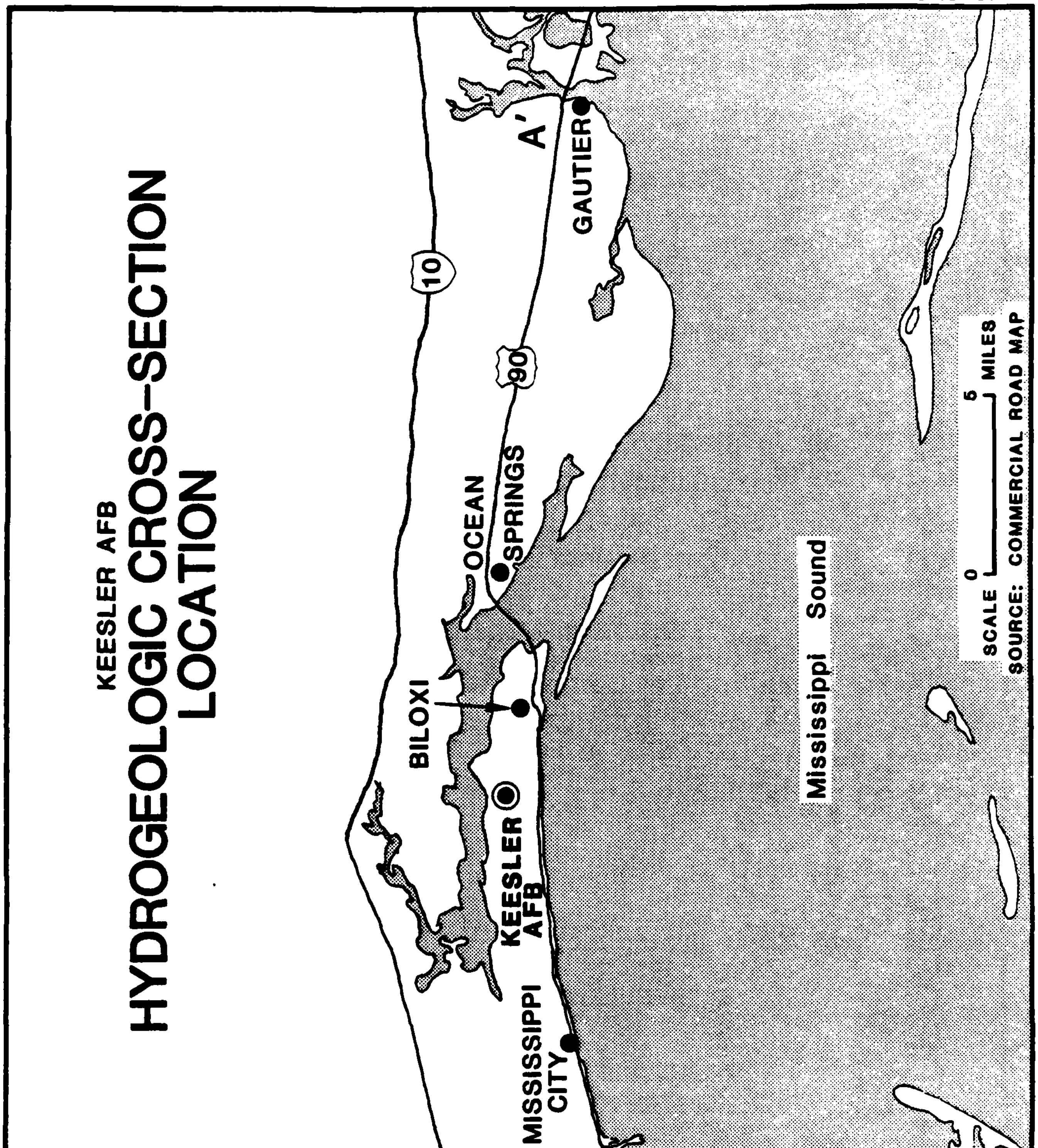

KEESLER AFB
HYDROGEOLOGIC CROSS-SECTION
FROM LONG BEACH TO GAUTIER
KEESLER AFB WELL NO. 2
RECENT AND PAMLICO DEPOSITS
CITRONELLE(?) FORMATION
GRAHAM FERRY FORMATION
PASCAGOULA FOSSILS (JOHNSON)
A
A'
LONG BEACH
GULFPORT
MISS. CITY
BILOXI
BACK BAY
OCEAN SPRINGS
GAUTIER
HARRISON | JACKSON
VERTICAL SCALE
FEET
0
160
300
HORIZONTAL SCALE
0
6 MILES
LEGEND
SAND
GRAVEL
SAND & SHALE OR CLAY
SAND & GRAVEL
CLAY, SHALE OR GUMBO
SANDSTONE, LIMESTONE, ROCK
SOURCE: MODIFIED FROM BROWN, et al, 1944

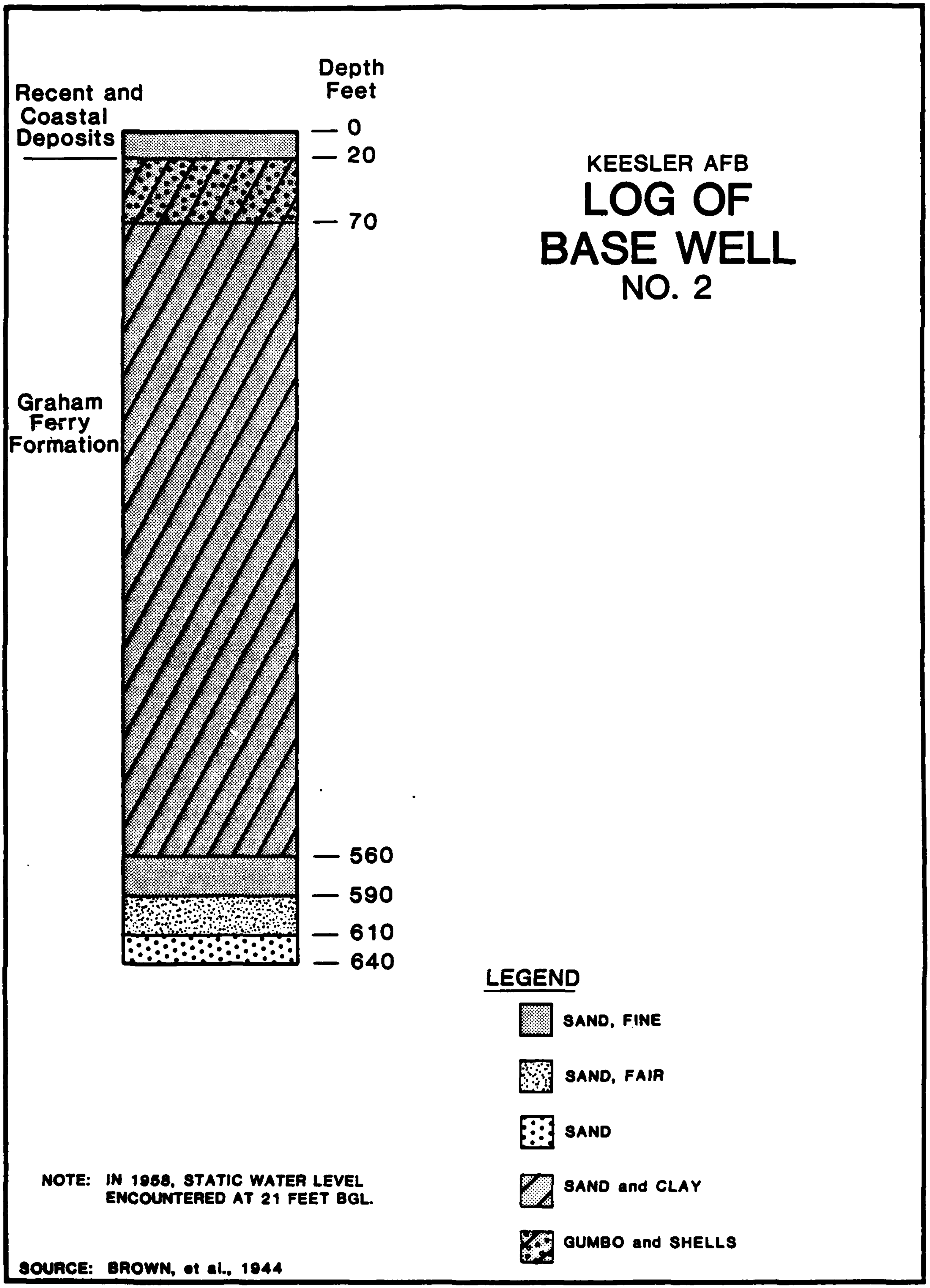
FIGURE 3.7A



KEESLER AFB
HYDROGEOLOGIC CROSS-SECTION LOCATION

SOURCE: COMMERCIAL ROAD MAP

FIGURE 3.8


Depth
Feet
Recent and
Coastal
Deposits
0
20
70
Graham
Ferry
Formation
560
590
610
640
KEESLER AFB
LOG OF
BASE WELL
NO. 2
LEGEND
SAND, FINE
SAND, FAIR
SAND
SAND and CLAY
GUMBO and SHELLS
NOTE: IN 1958, STATIC WATER LEVEL
ENCOUNTERED AT 21 FEET BGL.
SOURCE: BROWN, et al., 1944

The coastal deposits are underlain by the Pliocene Citronelle Formation across most of the Southern Mississippi Gulf Coastal Plain. The Citronelle is a fairly extensive aquifer throughout much of southern Mississippi; however, in the immediate vicinity of Keesler Air Force Base, it may be thin, discontinuous or completely absent (see Figure 3.7). The Citronelle, where present, consists of red sand and gravel and, on occasion, white clays. Its thickness is highly variable; its typical saturated thickness is reported to be on the order of 45 feet (Wasson, 1980). The hydraulic conductivity is reported to be 150 feet per day (Wasson, 1980). The unit is reported to receive most of its recharge where it crops out at ground surface in the northern sections of Jackson, Harrison and Hancock Counties (Figure 3.3, page 3-12). Some recharge is probably received as leakage from overlying units. Water is typically contained in the unit under artesian (confined) conditions where it is overlain and under water table conditions in much of the outcrop area. Discharge from the unit is probably directed seaward, to the Mississippi Sound. Keesler AFB area water levels within the Citronelle are not known.

The Lower Pliocene Graham Ferry Formation, the Upper Miocene Pascagoula Formation, the Miocene Hattiesburg and Catahoula Formations are collectively identified as the "Miocene aquifer system" or "Miocene sands." The Graham Ferry, which immediately underlies the thin or discontinuous Citronelle in the study area, overlies the Pascagoula (Figure 3.7). The two are frequently developed as one aquifer and are also probably in hydraulic communication. Water is contained in the Miocene in extensive sand beds under artesian conditions. The sand beds are frequently separated by thick but irregular clay strata. The sand beds vary from a few feet to several hundred feet in thickness. Recharge of the unit occurs where it crops out (Figure 3.3, page 3-12) or in subcrop areas where it is in communication with the Citronelle (Wasson, 1980). Discharge is directed south, or seaward to the Mississippi Sound. At base Well Number 2, the unit occurs at a depth of some 20 feet and probably exceeds 1,000 feet in total thickness. Ground water is usually obtained from extensive sand beds 560 or more feet below ground surface in the vicinity of Keesler Air Force Base. These water-bearing sands are known to be overlain by thick clay beds which can be seen on the hydrogeologic section, Figure 3.7. The water level measured in base Well Number 2 rose to within 21 feet of ground surface (1958 data). The present potentiometric surface is some 30 to 50 feet below ground surface. This value appears to be representative of study area Miocene aquifer water levels. In past years, several wells were reported to flow naturally under the influence of strong artesian pressures (Lusk, 1953). Extensive development has reduced these pressures significantly. The Miocene system is the most prolific and intensely utilized aquifer in Southern Mississippi. Production values in city wells of up to 5,000 gallons per minute have been reported (Wasson, 1980).

Base Wells

Keesler Air Force Base (main installation), Thrower Park, and East and West Falcon Park housing areas obtain water supplies from a system of 12 potable supply wells. Additionally one potable supply well (#6) is now abandoned. Water supplies for the Harrison Court housing area are purchased from the City of Biloxi. All of the supply wells are presumably screened into deep aquifers. A separate shallow well is utilized to service the golf course. Figure 3.8, the log of base Well Number 2, depicts subsurface conditions that are reasonably representative of the study area. The log indicates that a substantial thickness of low permeability strata, from 20 to 560 feet below ground surface, was encountered during the construction of Well Number 2. The artesian water level measured in 1958 at this well was 21.0 feet below ground surface. Current water levels are thought to average 50 feet below ground level (USGS file data). Table 3.4 summarizes base well information. Base well locations are shown on Figures 3.9 and 3.9A.

Off-Base Well Locations

The adjacent City of Biloxi obtains its water supplies from several deep wells, screened and sealed into the Miocene aquifers at substantial depth below ground surface. Figure 3.10 depicts the locations of municipal wells near Keesler Air Force Base. It is unlikely (but unconfirmed) that any private wells remain in service near the installation.

Ground-Water Quality

Ground-water quality information has been obtained from Brown, et al. (1944); Newcome, et al. (1968); Wasson (1980); interviews with U.S.

TABLE 3.4
KEESLER AFB WELL INFORMATION

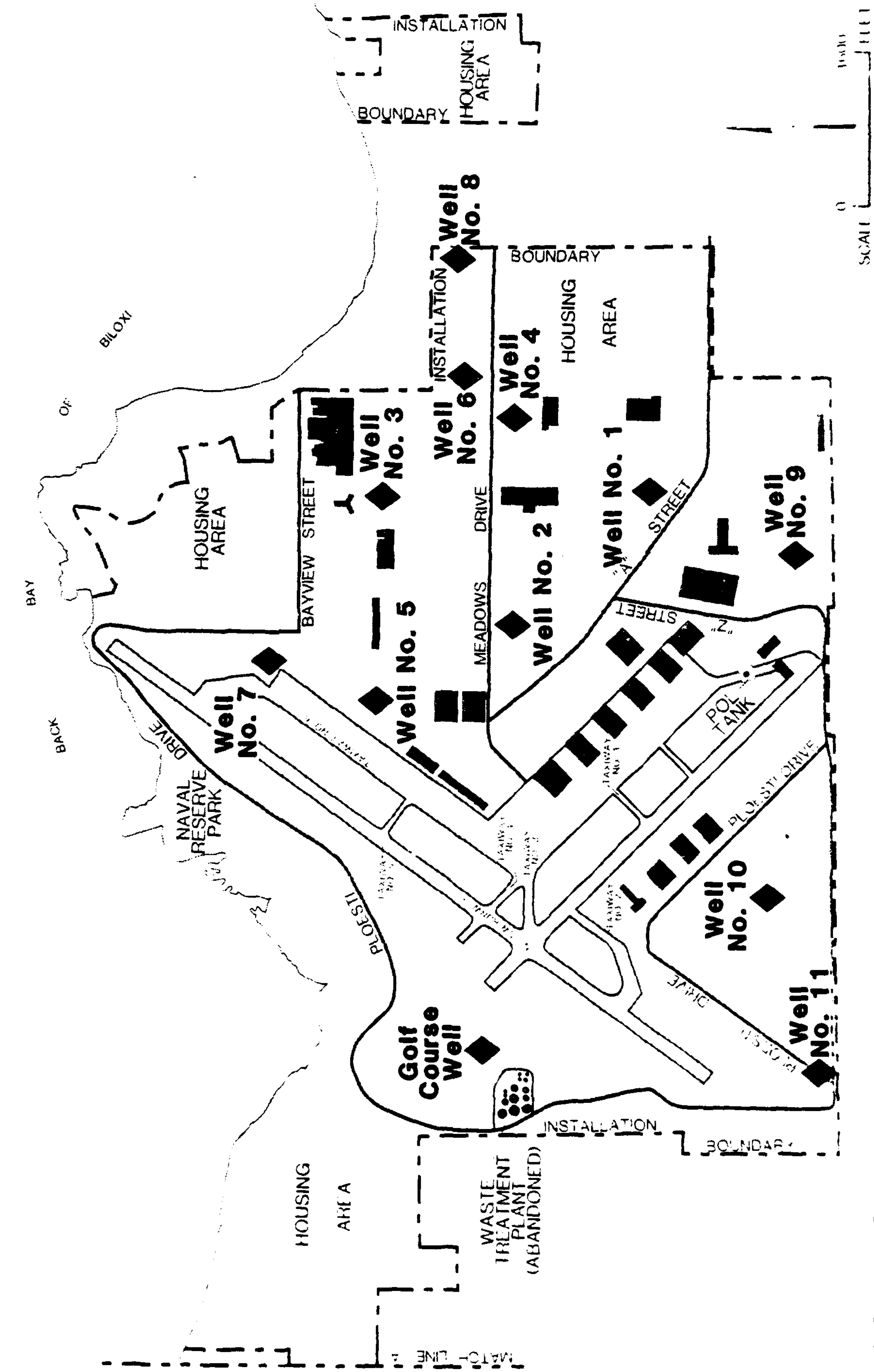
Base No.	Bldg.	USGS No.	Well Depth, ft	Static Water Level, ft Below LSD	Measurement Date	Screen Diam. (in)	Screen Length (ft)	Primary Aquifer (USGS Class.)	Test Capacity (GPM)	Remarks
1	3509	M64	690	26.0	1964	10	60	Graham Ferry, Pliocene	586	
2	1921	M67	972	21.0	1958	10	--	Miocene Series	550	
3	0621	M66	628	15.5	1958	10	63	Graham Ferry, Pliocene	690	
4	2121	M65	638	38.0	1967	10	42	Graham Ferry, Pliocene	400	
5	0916	M68	623	20.5	1958	10	40	Graham Ferry, Pliocene	516	
6	--	M63	650	+2.0	1942	10	--	Graham Ferry, Pliocene	--	Abandoned.
7	0242	M75	611	19.0	1951	12	40	Graham Ferry, Pliocene	700	
8	6005	M76	631	23.0	1951	12	40	Graham Ferry, Pliocene	700	
9	3967	M77	639	14.0	1951	12	40	Graham Ferry, Pliocene	700	
10	7301	M78	642	16.0	1951	12	40	Miocene Series	700	
11	7501	M79	641	13.0	1951	12	40	Miocene Series	700	
12	9161	M82	684	--	--	--	--	Graham Ferry, Pliocene	--	West Falcon Park Well Information Not On File
13	7721	--	652	48.0	1978	10	85	-- -- --	1200	East Falcon Park Well
—	6634	--	60	+0.5*	1984	4	--	**	40	Golf Course Well

Source: Keesler AFB and USGS File Data

* Water level is one-half foot above local land surface datum.
** Unconfirmed.

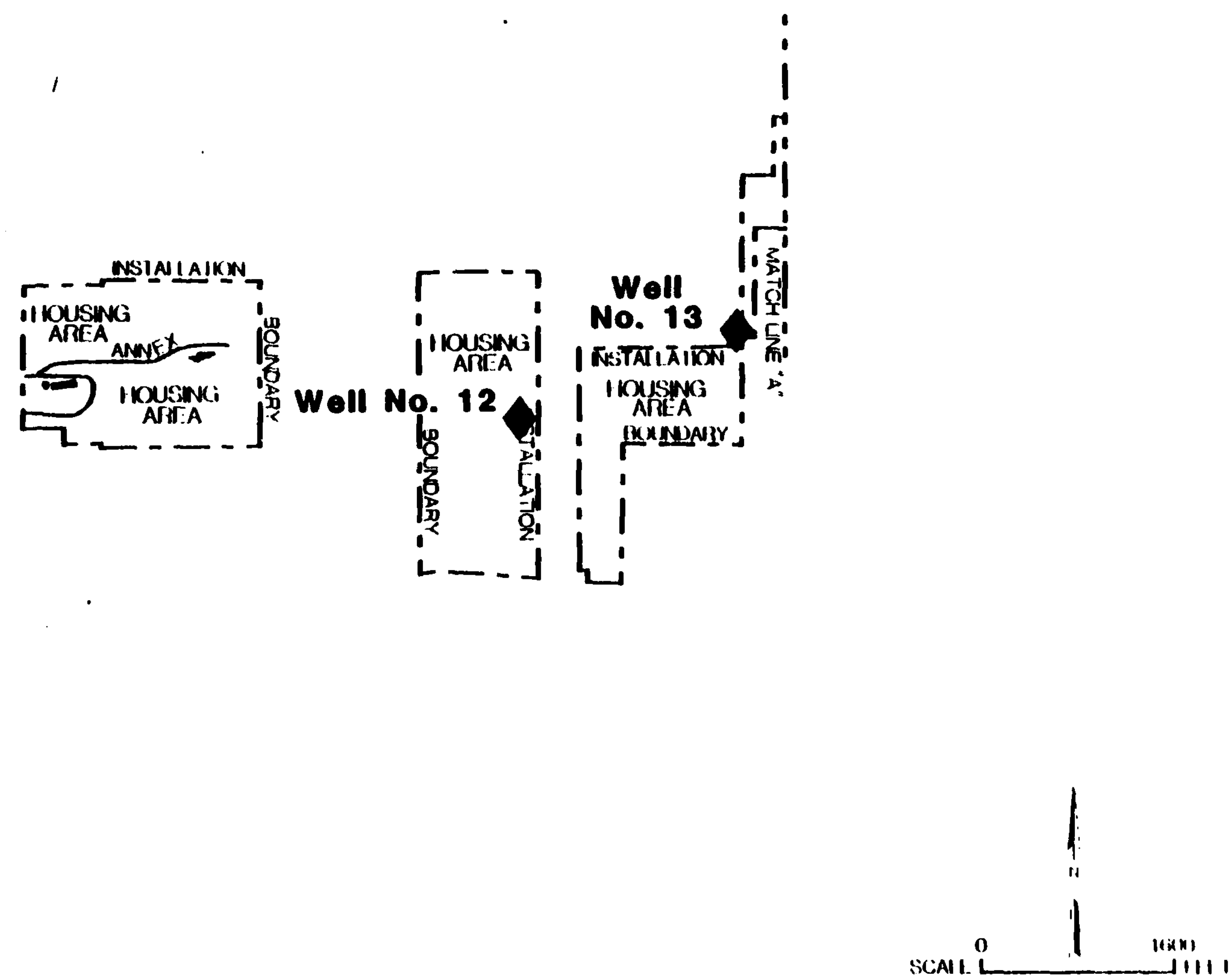
FIGURE 3.9

KEESLER AFB
BASE WELL LOCATIONS



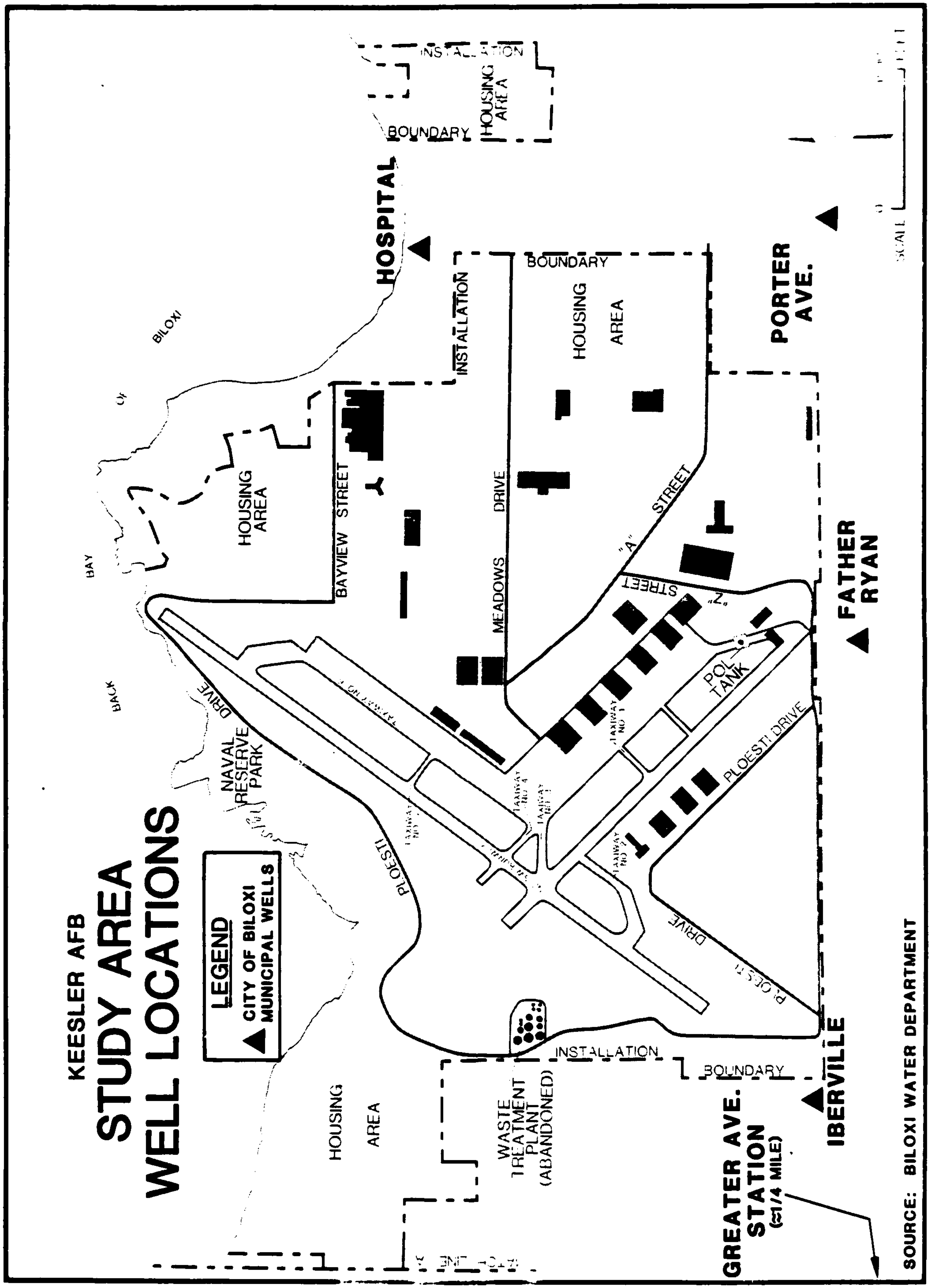
SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

KEESLER AFB
BASE WELL LOCATIONS (cont'd)



SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

FIGURE 3.10



ES ENGINEERING-SCIENCE

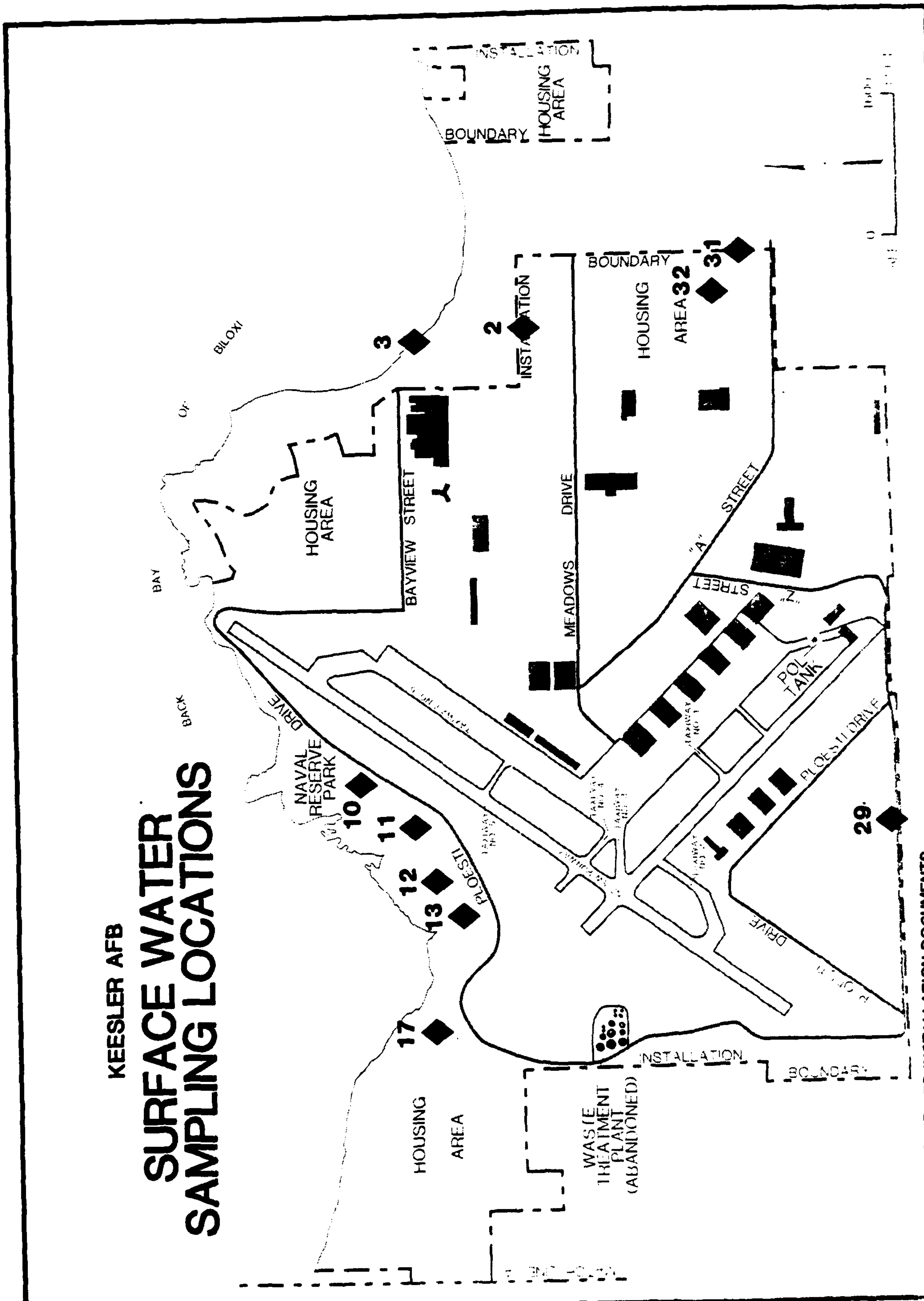
Geological Survey, who provided voluminous file data and an interview with a City of Biloxi Water Department official. Historically, ground water obtained from base and municipal wells penetrating the regional (Miocene) aquifers has been of good quality. The only water quality problems of significance that have been identified are those concerning the shallow (Coastal Sands) aquifer. Brown, et al. (1944) reported the degradation of this unit in the early 1940's due to sewage contamination, most likely from septic tanks or tile fields. Also, it has been reported that the unit possesses high chloride, nitrate, and fluoride levels, probably due to saltwater intrusion.

A gasoline spill from a contractor's storage facility at the Naval Reserve Park was reported in 1983. A subsequent investigation indicated the contamination of the shallow aquifer by gasoline. A recovery effort utilizing well points removed some 1,400 gallons of product from the shallow water-bearing zone. Further subsurface testing suggested that the recovery effort was successful.

SURFACE WATER

The two major receiving waters adjacent to the study area consist of the Back Bay of Biloxi and Mississippi Sound. Most installation drainage is directed to the Back Bay. A few small tidal estuaries extend from the Bay onto the installation's northern section. The State of Mississippi has classified the Back Bay as a water resource reserved for shellfish harvesting and Mississippi Sound as suitable for recreation (Mississippi Department of Natural Resources, Bureau of Pollution Control Water Quality Criteria for Intrastate, Interstate and Coastal Waters, 25 February 1982, pages 11 and 12). Specific criteria are included in Appendix D, Table D.2.

Surface water samples are routinely collected at ten locations within the installation. The sampling stations are identified on Figure 3.11. A review of recent water quality data on file with BES (sample data in Table D.3, Appendix D) indicated that no significant water quality problems exist at Keesler Air Force Base. Interviews with Mississippi Bureau of Pollution Control personnel also indicate that no surface water quality problems exist relative to the installation.



SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

During the 1950's and 1960's several industrial shops and wash areas were known to have discharged or occasionally spilled wash water, dilute cleaning solutions, oils, and fuels into the various drainage systems on the base. Shop wastes are no longer discharged to the storm drainage system. The base has installed several oil/water separator systems at key washracks and in 1977, constructed a skimming system and retention basin along drainage alignments to divert and retain any floating substances accidentally discharged or spilled into the drainage system.

BIOTIC ENVIRONMENT

Keesler Air Force Base is located in a tidal zone. Wetlands have been identified on base, which support a variety of grasses, shrubs and trees. No woodland areas exist on the base. No crops are grown on base. No rare, threatened or endangered plant or animal species is known to be indigenous to the installation. The Least Tern, a threatened or endangered bird species, is transient to the installation.

SUMMARY OF ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation indicate the following major points that are relevant to the evaluation of past hazardous waste management practices at Keesler Air Force Base:

- Surface soils of the Keesler Air Force Base area are typically sandy and permeable. The water table is generally less than 10 feet below the surface.
- The Coastal Deposits at Keesler AFB are either exposed or very near ground surface. This formation is considered to be an aquifer of limited significance in the study area. The base is located within the recharge zone of this aquifer.
- The mean annual precipitation is 61.3 inches and the net precipitation is calculated to be 13.3 inches.
- The major regional aquifer exists at great depth in the study area (about 500 feet below ground surface). The regional aquifer is recharged at some distance from the base, but may receive

some local recharge as leakage thorugh semi-pervious zones from overlying shallow aquifers.

- No evidence of contamination has been identified in wells constructed in the regional aquifer.
- Flooding is known to be a problem typical of the Keesler Air Force Base area.
- The surface water streams exiting the base are considered to comply with water use classification.
- No threatened or endangered species are indigenous to Keesler Air Force Base.

From these major points, it may be seen that potential pathways for the migration of hazardous waste-related contamination exist. If hazardous materials are present in or on the ground, they may encounter a shallow aquifer and subsequently be discharged to area surface waters. The potential for the migration of contamination to the major regional aquifer is considered to be remote.

SECTION 4

FINDINGS

This section summarizes the hazardous waste generated by past activity, describes past waste disposal methods, identifies the disposal and spill sites located on the base, and evaluates the potential for environmental contamination.

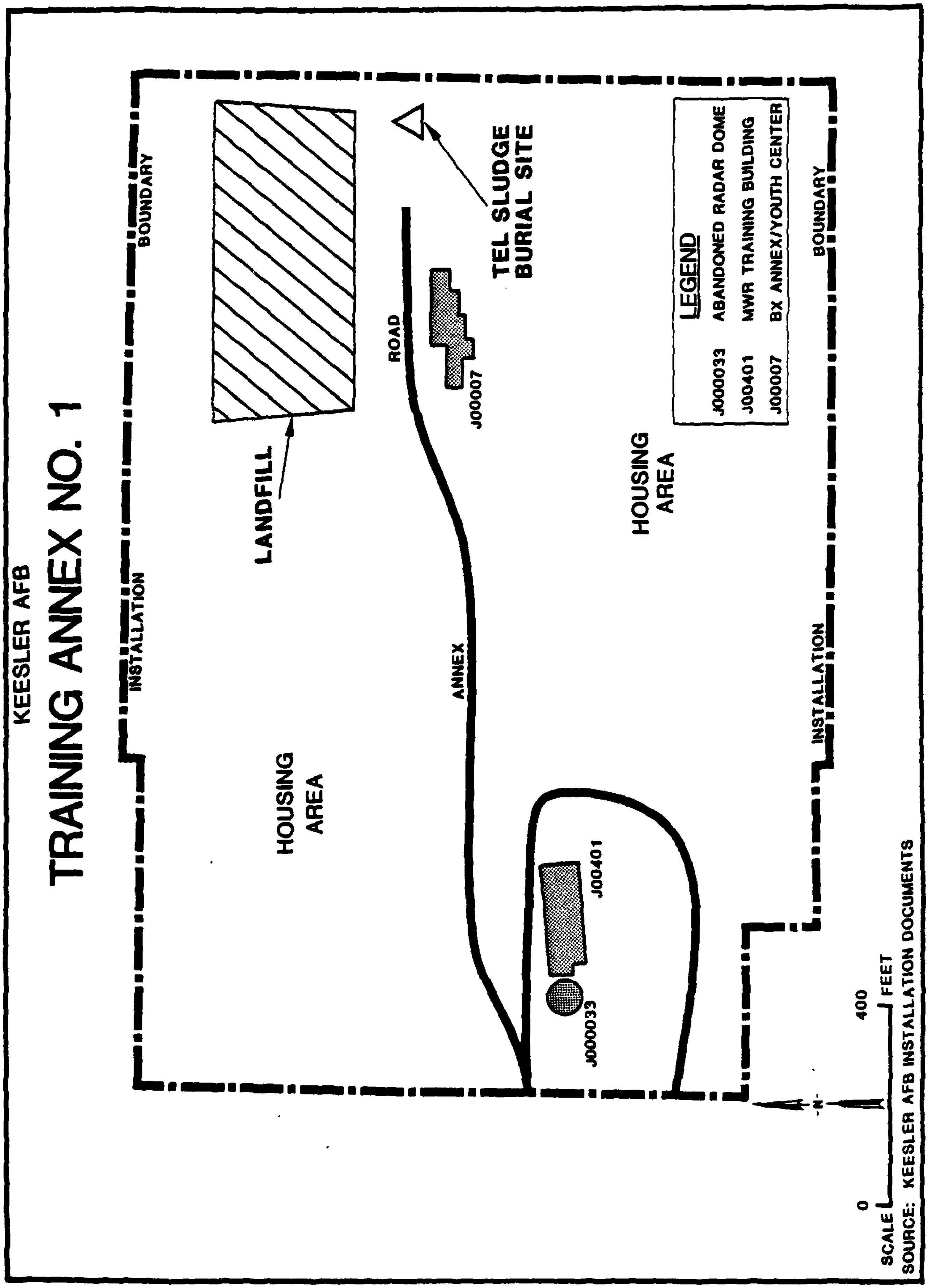
REMOTE ANNEXES REVIEW

A review of files and records and interviews with present and past base employees were carried out to identify past activities at all remote base annexes which could have resulted in the disposal of hazardous waste.

The Training Annex No. 1 Site (Thrower Park) has been used for waste disposal. A landfill was operated at the northeastern end of the site (see Figure 4.1) from 1968 until 1971. Normal base refuse was disposed and burned regularly during the period of use. No evidence of disposal of hazardous wastes in this landfill was found. The landfill was closed and covered with soil in the early 1970's. At present the site has grass growing on the soil cover. Also disposed at Training Annex No. 1 in about 1970 were three 55-gallon drums of tetraethyl lead (TEL) sludge (see Figure 4.1). These drums were buried at a depth of six feet or less at the eastern end of the site, adjacent to a power pole in the fenced and locked Thrower Park Boat and Trailer Lot.

At the Small Arms Range annex, firearms training is performed. All wastes generated from firearms maintenance activities (small volumes of waste solvents and oils) are placed in containers and are transported to the base for disposal in the POL slop tank. No evidence of disposal of hazardous or potentially hazardous wastes at this site was found.

FIGURE 4.1



KEESLER AFB
TRAINING ANNEX NO. 1
INSTALLATION BOUNDARY
LANDFILL
TEL SLUDGE BURIAL SITE
ANNEX ROAD
HOUSING AREA
HOUSING AREA
J00007
J00401
J000033
LEGEND
J000033 ABANDONED RADAR DOME
J00401 MWR TRAINING BUILDING
J00007 BX ANNEX/YOUTH CENTER
INSTALLATION BOUNDARY
SCALE 0 400 FEET
N
SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

PAST BASE ACTIVITY REVIEW

To identify past base activities that resulted in generation and disposal of hazardous waste, a review was conducted of current and past waste generation and disposal methods. This activity consisted of a review of files and records, interviews with present and former base employees, and site inspections.

The source of most hazardous wastes on Keesler AFB can be associated with one of the following activities:

- o Industrial operations (shops)
- o Fire protection training
- o Pesticide utilization
- o Fuels management
- o Waste storage sites
- o Wash racks
- o Spills and leaks

The subsequent discussion addresses only those wastes generated at Keesler AFB which are either hazardous or potentially hazardous. Potentially hazardous wastes are grouped with and referenced as "hazardous wastes" throughout this report. A hazardous waste, for this report, is defined by, but not limited to, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). For study purposes, waste petroleum oils and solvents are also included in the "hazardous waste" category even though the State of Mississippi does not characterize them in this manner. No distinction is made in this report between "hazardous substances" and "hazardous wastes". A potentially hazardous waste is one which is suspected of being hazardous although insufficient data are available to fully characterize the material.

Industrial Operations (Shops)

Industrial operations at Keesler AFB are grouped into six major units:

1. Civil Engineering Squadron
2. Air Base Group
3. Transportation Squadron

4. Technical Training Wing
5. USAF Hospital
6. Tenant Units

From mid-1941 through the present, industrial operations (shops) at Keesler AFB have included maintenance activities to support aircraft flying missions. These shops maintain, fabricate and repair components and parts of aircraft and ground equipment. A list of past and present industrial shops was obtained from the Bioenvironmental Engineering Services (BES) files. Information contained in the files indicated those shops which generate hazardous waste and/or handle hazardous materials. A summary review of the shop files is shown in Appendix E, Master List of Shops.

For those shops that generated hazardous waste, key personnel within the base maintenance support functions were interviewd. A timeline of disposal methods was established for major wastes generated. The information from interviews with base personnel and base records has been summarized in Table 4.1. This table presents a list of building locations as well as the waste material names, current or most recent estimates of waste quantities, disposal method and timeline. If significant changes in generation rates with time were found, these changes are noted under the waste quantity heading. Many of the disposal methods were identified from information obtained from personnel currently at the base. The waste quantities shown in Table 4.1 are based on verbal estimates provided by shop personnel at the time of the interviews. All shops that generate hazardous waste are listed in Table 4.1.

Aircraft support shops have for the most part remained in their present location for a number of years, and wastes and waste disposal practices have not changed significantly. The wastes generated in the shops at Keesler AFB consist mainly of contaminated jet fuel (JP-4), waste oils, waste engine fluids and lubricants, acid and alkaline cleaning solutions, solvents, paint strippers and paint sludges.

Prior to 1978, waste JP-4 and diesel fuel at Keesler AFB were typically burned at the base fire protection training area. During the 1978-1982 period the wastes were removed by off-base contractors for

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	CURRENT WASTE QUANTITY	METHOD(S) OF WASTE MANAGEMENT (1940–1980)
3380 ABG/DA				
FIELD PRINTING	901	PHOTOCHEMICALS	70 GALS./MO.	1955 SANITARY SEWER
AIRCRAFT MAINTENANCE SQUADRON				
AIRBORNE NAVIGATIONAL MAINT.	4203	LOW-LEVEL RADIOACTIVE TUBES	3 TUBES/MO.	1941 REFUSE
3380 ABG/SP				
COMBAT ARMS	3913	PD-680	5 GALS./MO.	OBC
CIVIL ENGINEERING SQUADRON				
POL MAINTENANCE	4409	JP-4	250 GALS./MO.	OBC/FPTA
	4038	MOGAS	70 GALS./MO.	OBC
	4409	WASTE OIL	650 GALS./MO.	OBC
HEATING/BOILER PLANT	4101	MORPHOLINE	14,760 LBS./YR.	SANITARY SEWER 1979
		QUEBRA TANNIN EXTRACT	5,465 LBS./YR.	SANITARY SEWER
		SODIUM HEXAMETAPHOSPHATE	495 LBS./YR.	INTERMITTENT TO SANITARY SEWER
POWER PRODUCTION	468	BATTERY ACID	5 GALS./MO.	NEUTRALIZED TO SANITARY SEWER

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

OBC: OFF-BASE CONTRACTOR

FPTA: FIRE PROTECTION TRAINING AREA

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	CURRENT WASTE QUANTITY	METHOD(S) OF WASTE MANAGEMENT 1940 1950 1960 1970 1980
FIELD MAINTENANCE SQUADRON				
NDI SHOP	230	DYE-PENETRANT	110 GALS./YR.	1945 OBC
		PHOTOCHEMICALS	10 GALS./YR.	SANITARY SEWER
		PD-680	1,000 GALS./MO.	OBC
		CUTTING OIL	10 GALS./MO.	OBC
AGE SHOP	4204	WASTE OIL	65 GALS./MO.	OBC
		JP-4	2 GALS./MO.	OBC/FPTA
PNEUDRAULICS SHOP	4204	HYDRAULIC FLUID	10 GALS./MO.	OBC
		PD-680	18 GALS./MO.	OBC
REPAIR & RECLAMATION SHOP	4204	PD-680	65 GALS./MO.	OBC
ENGINE SHOP	4205	WASTE OIL	100 GALS./MO.	OBC
		PD 680	10 GALS./MO.	OBC
		METHYL ETHYL KETONE	1 GAL./MO.	OBC

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

OBC: OFF-BASE CONTRACTOR

FPTA: FIRE PROTECTION TRAINING AREA

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	CURRENT WASTE QUANTITY	METHOD(S) OF WASTE MANAGEMENT (1940–1980)
FUEL SYSTEMS REPAIR	4254	JP-4	25 GALS./MO.	1945 OBC/FPTA ---→
CORROSION CONTROL	4306	VARIOUS PAINT REMOVERS WASTE PAINT PRIMERS	50 GALS./MO.	OBC ---→
		WASTE PAINT	110 GALS./MO.	OBC ---→
USAF HOSPITAL				
CLINICAL RESEARCH	404	ANIMAL DIPS	<10 GALS./MO.	1950 PRETREATED TO SANITARY SEWER ---→
DENTAL CLINIC	824	DILUTE CIDEX ACTIVATED DIALDEHYDE	50 GALS./MO.	SANITARY SEWER ---→
MORALE, WELFARE & RECREATION				
AERO CLUB	4204	WASTE OIL	15 GALS./MO.	1945 OBC/FPTA ---→
		HYDRAULIC FLUID	<1 GAL./MO.	OBC ---→
AUTO HOBBY	5904	WASTE OIL	900 GALS./MO.	OBC ---→

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

OBC: OFF-BASE CONTRACTOR
FPTA: FIRE PROTECTION TRAINING AREA

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	CURRENT WASTE QUANTITY	METHOD(S) OF WASTE MANAGEMENT 1940 1950 1960 1970 1980
ORGANIZATIONAL MAINTENANCE SQUADRON				
BASE OPERATIONS (TRANSIENT MAINTENANCE)	4205	WASTE OIL	8 GALS./MO.	1945 OBC
INSPECTION DOCK	4205	WASTE OIL	220 GALS./MO.	1941 OBC
		LUBE OIL	1 GAL./MO.	OBC
		HYDRAULIC FLUID	200 GALS./MO.	OBC
BASE SERVICES				
LAUNDRY/DRY CLEANING	4103	PERCHLOROETHYLENE	110 GALS./MO.	OBC
		BLEACH	1,000 GALS./MO.	PRETREATED TO SANITARY SEWER
TECHNICAL TRAINING WING				
VISUAL SERVICES	231	PHOTOCHEMICALS	320 GALS./MO.	SANITARY SEWER
TRANSPORTATION SQUADRON				
VEHICLE MAINTENANCE SHOP	4430	TRANSMISSION FLUID	9 GALS./MO.	OBC
		HYDRAULIC FLUID	12 GALS./MO.	OBC
		PD-680	25 GALS./MO.	SANITARY SEWER; 1981 OBC

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

OBC: OFF-BASE CONTRACTOR

FPTA: FIRE PROTECTION TRAINING AREA

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	CURRENT WASTE QUANTITY	METHOD(S) OF WASTE MANAGEMENT 1940 1950 1960 1970 1980
VEHICLE MAINTENANCE SHOP (CONT.)	4430	WASTE OIL	200 GALS./MO.	1941 OBC
		BATTERY ACID	15 GALS./MO.	NEUTRALIZED TO SANITARY SEWER
		SPENT ANTIFREEZE	50 GALS./MO.	DILUTED TO SANITARY SEWER
		SOLVENTS CONTAMINATED WITH OIL PAINT	50 GALS./MO.	OBC
		PAINT THINNER	5 GALS./MO.	OBC

KEY

———CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - -ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

OBC: OFF-BASE CONTRACTOR

FPTA: FIRE PROTECTION TRAINING AREA

disposal or recycle. The use of contaminated fuel has been resumed for fire protection training exercises.

Waste acid and alkaline solutions were generally piped to the sanitary sewer in either a diluted or neutralized state. Liquid solvents and paint strippers have typically been removed by an off-base contractor for disposal or recycle. Waste paint and paint sludges prior to 1981 were considered as ordinary refuse and were disposed of as such. Since 1981, these wastes have been disposed of by off-base contractors.

Fire Protection Training

The fire protection training area on Keesler AFB is located at the north end of the base, north of Ploesti Drive and southwest of the Naval Reserve Park, and is bordered on the north by the Back Bay of Biloxi (see Figure 4.2). Fire protection training exercises have been conducted at this site since 1955, and continue at the present time. Prior to 1955, organized fire training exercises were not conducted at this base. Fire extinguishing agents used have included protein foam (prior to 1972) and AFFF (since 1972).

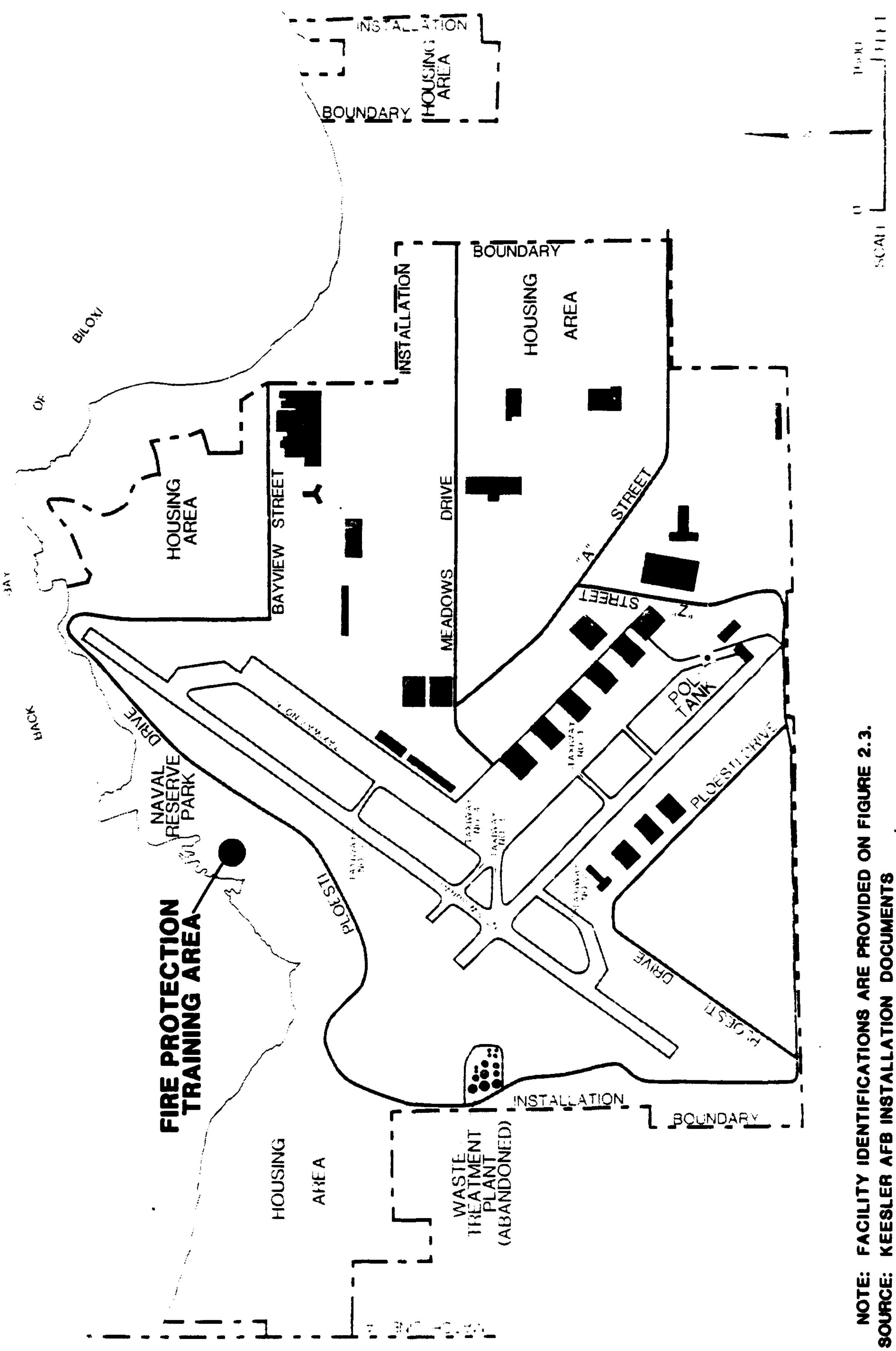
As constructed in 1955, the fire protection training area included an earthen dike of 12 to 18 inch height surrounding an aircraft mockup on an earthen base. For fire training exercises the dike was partially filled with water, and fuel (90% contaminated JP-4 and 10% waste diesel) was added, ignited, and extinguished. A fuel drainage and collection system was not operated at the site until 1981.

In 1981, the old mockup area was replaced with a concrete foundation, concrete dike, a new mockup, and a fuel reclamation system along with one smaller, additional concrete burn pit. The new facilities are constructed over the site of the old training area. In the present configuration, about 1,500 gallons of water is added to the large diked area followed by 400 to 600 gallons of fuel. The smaller pit takes only 50 gallons of fuel. At present two exercises are performed per quarter per burn pit. After extinguishing the fire, the remaining fuel and water are pumped to an above ground settling tank. The water phase from this tank is discharged to the surrounding ground area.

Pesticide Utilization

Pest management has been conducted at Keesler AFB by the Civil Engineering Squadron since the base was activated. Herbicide and

KEESLER AFB
FIRE PROTECTION TRAINING AREA



NOTE: FACILITY IDENTIFICATIONS ARE PROVIDED ON FIGURE 2.3.
SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

insecticide applications have been performed by the Entomology Shop. The pest management program entails routine and requested chemical application and spraying indoors and out.

Pesticides are presently stored at the Entomology Shop storage facility (Bldg.6613). This has been the location of the Entomology shop since at least the 1960's. Pesticides on-hand at the time of the site visit are listed in Appendix D, Table D.1. A discussion of pesticide rinse disposal is presented in a later subsection.

Fuels Management

During the early period of base operations, AVGAS was delivered to Keesler AFB by railcar. Currently, all fuel is received by tank truck, as has been the practice since the mid-1960's. Fuel is distributed from the one JP-4 bulk tank by refueling truck; no hydrant system exists at Keesler AFB.

There are forty-three underground tanks for POL storage at Keesler AFB. A listing of these tanks is contained in Appendix D, Table D.4. These are used primarily for heating fuel and AVGAS storage.

Only one major spill or leak has been associated with the fuel management system at Keesler AFB. This spill involved the leakage of about 1,400 gallons of gasoline from an underground storage tank at the Naval Reserve Park. This spill is discussed further in the subsection entitled Spills and Leaks.

Waste Storage Sites

Waste materials are stored at several locations on Keesler Air Force Base, as follows:

1. Short-term storage at Hazardous Waste Accumulation Points (HWAP).
2. DPDO Storage Facility (Building 4422).
3. CE Storage yard.
4. Underground waste POL storage.
5. Pretreatment Devices (Oil-water separators).

There are numerous hazardous waste accumulation points on the base; these are summarized in Table 4.1 (pages 4-5 through 4-9). From the time the base was activated until the mid-1970's, most wastes which were not transported in pipes to a treatment, storage, or disposal process were accumulated at the site of generation until a volume sufficient for contract disposal was collected.

The hazardous waste storage facility on Keesler Air Force Base is an open area in the DPDO storage yard consisting of a concrete foundation with concrete walls on three sides. The storage area is not diked. No spills of material from this site were noted in interviews or from base records. The prior site of DPDO activities and storage, an asphalt-paved area east of Building 4605, was used from the 1960's until 1972. No spills of note were reported at this site. However, prior to 1972, a number of electrical transformers which had been removed from service were stored on a small gravelled area immediately adjacent to the installation south fence near Building 4605. During the earliest period of base activities, salvage storage was located in what is presently the triangle area at the southwest end of the base; no spill incidents of note are asociated with this site.

The Civil Engineering Storage yard, adjacent to Building 4713, stores a number of nonhazardous materials. The major hazardous materials stored at this location are electrical transformers and other materials containing dielectric fluids which may include polychlorinated biphenyls (PCB's).

Underground waste POL storage tanks at Keesler Air Force Base have included four distinct areas, as shown in Table 4.2. No leaks from any of these storage areas were noted from base records or interviews.

Oil-water separators on Keesler Air Force Base are continuously operating in-line pretreatment devices, as described further in the subsection entitled Description of Past On-Base Treatment and Disposal Methods. The oil-water separators provide for storage of separated oil phases for contractor removal.

Wash Racks

Two wash racks are present on Keesler Air Force Base. A vehicle wash rack, located near Building 4227, is used for routine vehicle cleaning; presently this wash rack is used for cleaning vehicles from the 1839th Electronics Installation Group. An aircraft wash rack, Facility 0251, is located on the north end of the operations apron. The wastes from both wash racks are piped to oil-water separators. The

TABLE 4.2
WASTE POL UNDERGROUND STORAGE AREAS
KEESLER AFB

Location	Volume (gal.)	Waste Description
Motor Pool	1,000	Waste Oil
POL Area	12,000	Mixed Petroleum Waste
	12,000	Contaminated JP-4
	12,000	Waste Synthetic Oil
Auto Hobby Shop	1,000	Waste Oil
BX Station	500	Waste Oil

aqueous phases from the separators discharge into the base sanitary sewer; the oil phases are removed routinely from the separators by an off-base contractor.

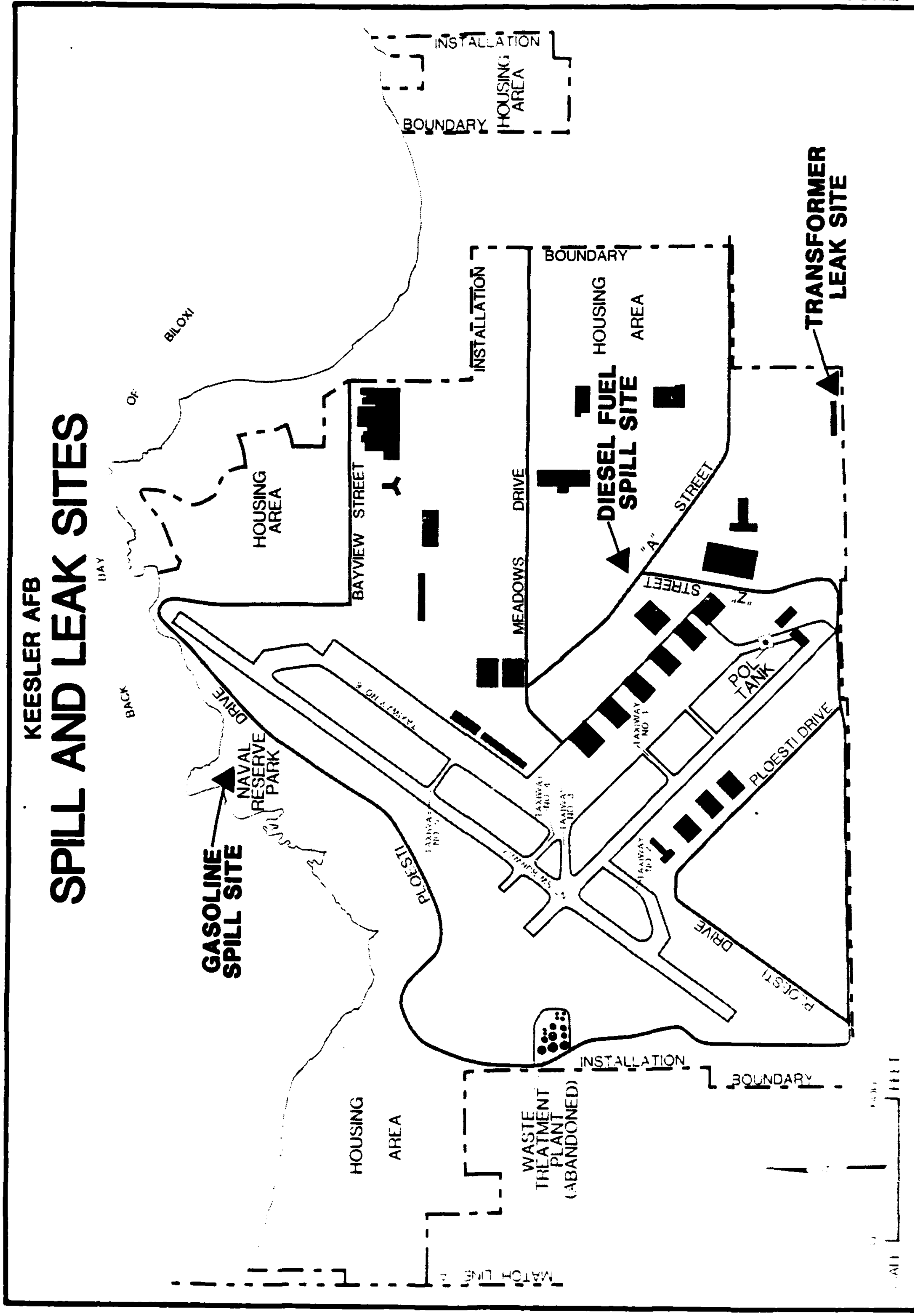
Spills and Leaks

Small fuel spills have occurred on several areas of the base. These spills are primarily attributed to fuel transfer and aircraft refueling operations. These spills typically occurred on paved areas and were promptly cleaned up. No significant environmental contamination is attributed to these spills.

Two significant fuel spills have occurred (see Figure 4.3). In March 1980, a spill of 570 gallons of diesel fuel occurred near Building 3101. A dam was built to contain the spill, and essentially all the diesel was pumped into 55-gallon drums and removed from the base. The remainder was trapped in a blocked sewer line and removed. In April 1983, a spill of approximately 1,400 gallons of gasoline (leaded) leaked from a newly installed underground tank at the Naval Reserve Park. The spilled gasoline was contained within the gravel surrounding the tank and in nearby soils. A well point system consisting of 10 shallow wells was installed and the majority of the spilled fuel was recovered. Monitoring of the Back Bay waters indicated that no hydrocarbon from this spill was released to the Back Bay. A single well point was left in place to promote evaporation of the spilled fuels. Because of the nature and extent of the reclamation operations, this site is considered to be fully decontaminated.

Several small (less than one quart) spills and leaks of dielectric materials have occurred in the asphalt-covered CE Storage Yard. These spills and leaks have been removed and the area cleaned by Civil Engineering personnel. No potential for environmental contamination is associated with these spills. One area of potential environmental contamination is the transformer storage area described previously (Figure 4.3). Although there was no evidence of major leaks from transformers stored in the area, numerous small leaks occurred. Because of the nature of dielectric fluids containing polychlorinated biphenyls (PCB's), this site is considered to have a potential for environmental contamination.

FIGURE 4.3



SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

DESCRIPTION OF PAST ON-BASE TREATMENT AND DISPOSAL METHODS

The facilities on Keesler AFB which have been used for the management and disposal of wastes can be categorized as follows:

- o Landfills
- o Hardfill Disposal Area
- o Tetraethyl Lead Sludge Burial Sites
- o Etching Shop Pit
- o Surface Impoundments
- o Low-Level Radioactive Waste Disposal Site
- o Incinerators
- o Wastewater Treatment Plant
- o Storm Water Drainage System
- o Oil-Water Separators
- o Pesticide Rinse Disposal Pit

These facilities are discussed individually in the followng subsections.

Landfills

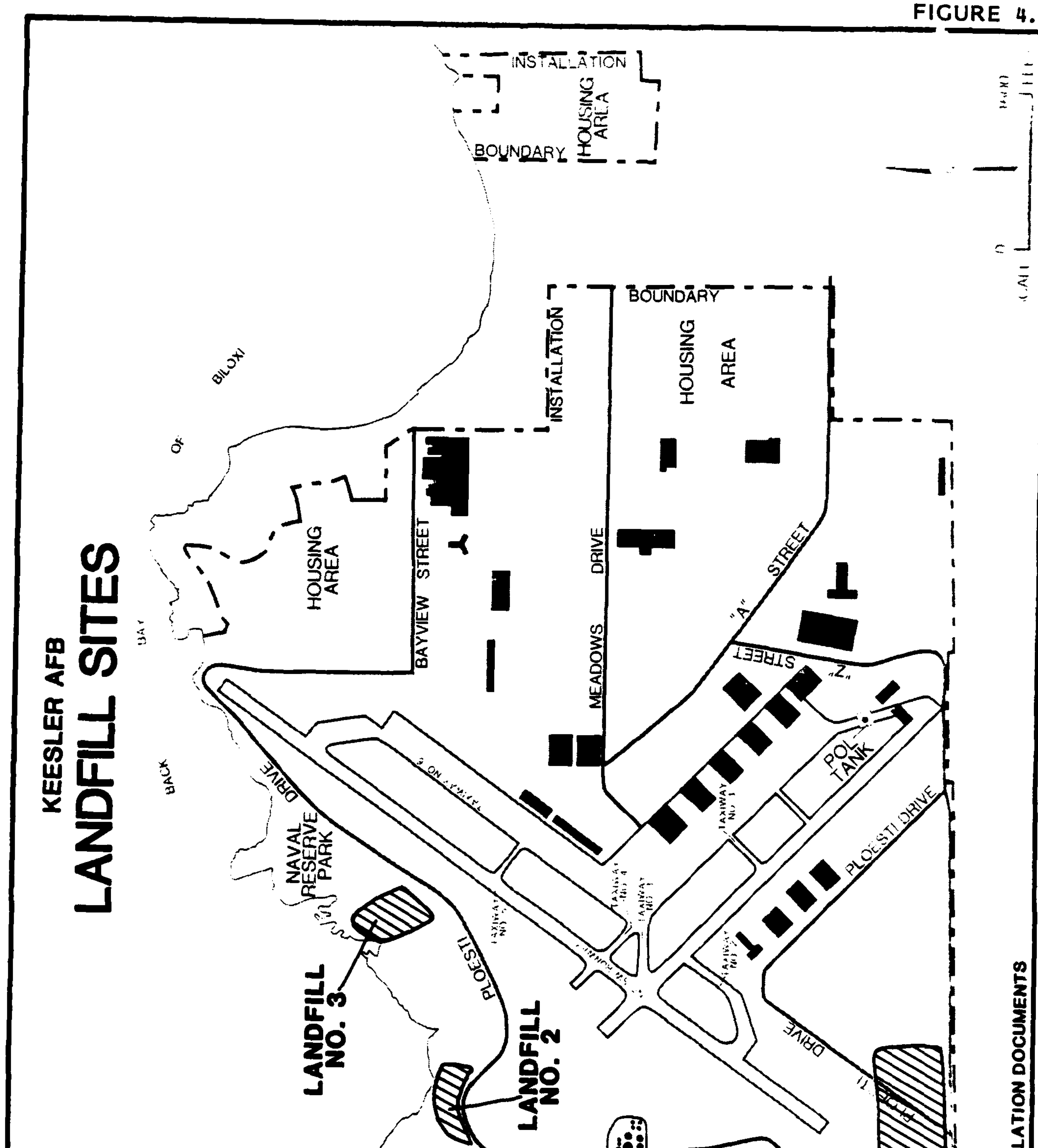
On-base landfills at Keesler AFB have been used for disposal of nonhazardous solid wastes and some industrial waste materials. Landfills have been operated at three locations on the main base, as shown in Figure 4.4. Table 4.3 contains a summary of information pertaining to these landfills, as well as the landfill at Training Annex No. 1, which was discussed previously.

Landfill No. 1

Landfill No. 1, located at the southwest corner of the base, was used for disposal of base refuse from the time of initial base activity until 1950. Examination of aerial photographs indicates that the western end of the landfill was used during the early 1940's, and the eastern end was used during the middle and late 1940's. The landfill was a trench and fill operation, with trenches normally about 16 feet wide and up to five feet deep. Normal base refuse was disposed of in this landfill; no evidence of hazardous waste disposal at this site was found, although some shop wastes may have been disposed of in the landfill.

The landfill was closed in 1950, the area was filled and leveled, and the base golf course was constructed on the site in 1966.

FIGURE 4.4



SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

TABLE 4.3
SUMMARY OF LANDFILL DISPOSAL SITES
KEESLER AFB

Landfill Designation	Operation Period	Approximate Size (Acres)	Type of Waste	Method of Operation	Closure Status	Surface Drainage
Landfill No. 1	1940's - 1950	15	General refuse	Trench and fill	Closed, covered, base golf course presently over site	Drainage directed to Mississippi Sound by underground storm drain system.
Landfill No. 2	1947 - 1948	4	General refuse, paints, paint cans, waste paint solvents	Surface fill Weekly burning	Closed, covered, presently area is wetlands	Drains to Back Bay
Landfill No. 3	1950 - 1974	5	General refuse	Trench and fill	Closed, covered, present use is fire protection training and construction material storage	Drains to Back Bay
At Training Annex No. 1	1968 - 1971	10	General refuse	Trench and fill Some burning	Closed, covered, presently an open field	Drains to Bayou La Porte

Landfill No. 2

Landfill No. 2 was located in the northwest portion of the base, in an area which was adjacent to the north end of the old (northwest-southeast) runway. The site presently is occupied by the north end of the base golf course; adjacent sections of the old runway were removed prior to golf course construction.

Landfill No. 2 was used for disposal of normal base refuse, paint, paint cans, and some waste paint solvents during the late 1940's. The wastes were burned on a weekly basis during 1947 and 1948. Exact volumes of industrial wastes disposed of in Landfill No. 2 are not known, but it was estimated that the total quantity was small (less than 20 drums of liquid).

Landfill No. 3

Landfill No. 3 was used for disposal of normal base refuse from 1950 until 1974, when off-base disposal of all refuse was initiated. Located at the north end of the base, the site surrounds the Fire Protection Training area.

The landfill was a trench and fill operation; trenches were normally 16 feet wide and five feet deep. No evidence of hazardous waste disposal at this site was found. Upon closing of the site in 1975, the area was filled and leveled. At present, storage of some construction materials (primarily gravel) occurs at the site; the Fire Protection Training area is located at the center of the area.

Hardfill Disposal Sites

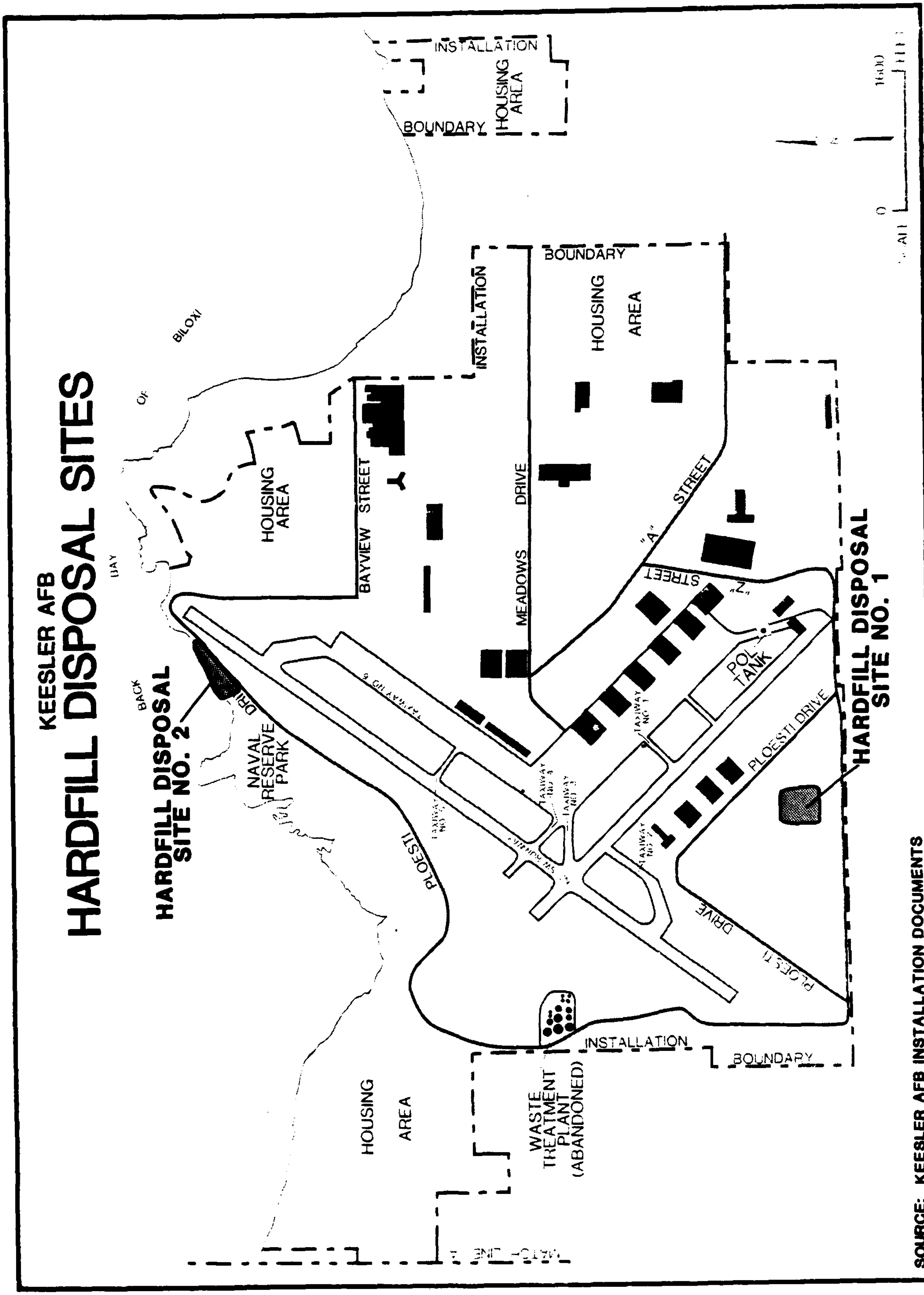
Two hardfill disposal areas have been identified on Keesler Air Force Base. These areas have been used for disposal of construction rubble and debris; no evidence of disposal of hazardous wastes at either site was found. The locations of these sites are shown in Figure 4.5.

Hardfill Disposal Site No. 1

Hardfill Disposal Site No. 1 was located in the triangle area at the southwest corner of the base. Scrap lumber and other construction debris was discarded at this location during the late 1940's. Buildings have been constructed over part of the site.

Hardfill Disposal Site No. 2

Hardfill Disposal Site No. 2 was located at the north end of the base adjacent to the Back Bay of Biloxi. This area was used for



SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

hardfill disposal as a means to build up and reclaim land in the Back Bay area. The site was used primarily for disposal of debris resulting from Hurricane Camille in 1970.

Tetraethyl Lead Sludge Disposal Sites

Two disposal sites for tetraethyl lead (TEL) sludge have been identified on Keesler Air Force Base. One of these sites is located at Training Annex No. 1 (Thrower Park), and has been discussed previously. The location of this site is shown in Figure 4.1 (page 4-2).

The second disposal site is in the northern end of the area occupied by Landfill No. 1, presently occupied by the golf course. The location of this site is shown in Figure 4.6. The depth of burial, volume of sludge buried, and types of containers are unknown. It is estimated that the sludge was buried in about 1942. The area is marked by one sign.

Etching Shop Pit

The Training Aids Etching Shop, located in Building 0231, generates acidic wastes which include xylene, ferric chloride, and potassium ferricyanide. Prior to 1981, these wastes flowed through a pipe to a drainage pit which consisted of three buried 55-gallon drums atop a French drain. The pit was southeast of the building and adjacent to "H" Street (see Figure 4.6). In 1981 the drainage pit was closed and the wastes were piped to the sanitary sewer. The drums and French drain remain buried at the site at present.

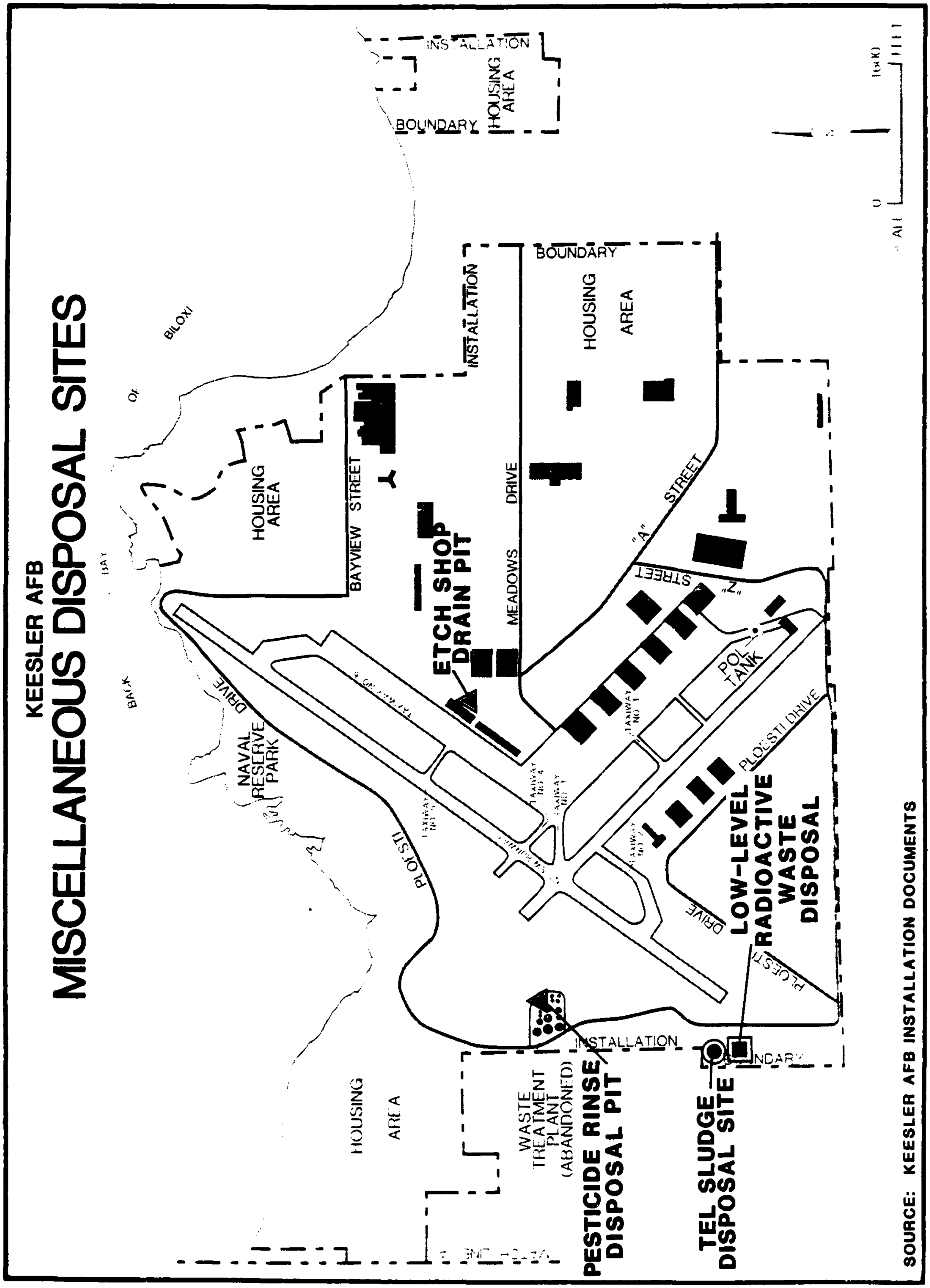
Surface Impoundments

Surface impoundments at Keesler Air Force Base consist of one pond on the base golf course used to control surface runoff. No episodes of contamination have been associated with this pond.

Low-Level Radioactive Waste Disposal Site

A concrete vault was buried at the northern portion of the Landfill No. 1 site in the mid-1950's for the disposal of low-level radioactive wastes (tubes and other low-level sources). Low-level wastes were added to the vault from its installation until about 1960. The site is presently occupied by the base golf course; no fencing or warning signs are present at the site. The location of this site is shown in Figure 4.6

FIGURE 4.6



KEESLER AFB
MISCELLANEOUS DISPOSAL SITES

SOURCE: KEESLER AFB INSTALLATION DOCUMENTS

Incinerators

Two incineration facilities are used at Keesler Air Force Base for waste disposal. Both facilities are used for pathological waste disposal, and both facilities were activated about 1980. The two facilities are the USAF Medical Center (Building 0468) and the Animal Research Clinic (Building 0404). These incinerators are permitted under the Clean Air Act. Ash from the incinerators is disposed of by off base contractors. Two prior incinerator locations, one near the Naval Reserve Park and the other in Block 100, were considered insignificant for the purposes of this study.

Wastewater Treatment Plant

The base wastewater treatment facility, located at the west end of the base east of Ploesti Drive, was constructed in the 1940's for treatment of sanitary wastewater. The plant was deactivated in 1975; since that time all wastewater has been treated by the City of Biloxi wastewater treatment plant. The facilities, which consisted of clarifiers, sludge digesters, high-rate bio-filters, a chlorination process, and sludge drying beds, remain in place at the site. During the period of use of the treatment plant, treated waters were discharged to the Back Bay of Biloxi. No record of contamination episodes of note are associated with operation of the wastewater treatment facilities.

Storm Water Drainage System

The storm water drainage system at Keesler Air Force Base consists of open ditches, concrete-lined conduit, and subsurface storm drainage lines. Most of the main installation and both of the annexes drain to the Back Bay of Biloxi and its tributaries (Bayou La Porte and Keegan Bayou) via 15 inch to 72 inch lines.

The Triangle area and the extreme southest corner of the main base connect to City of Bioloxi facilities which direct drainage to Mississippi Sound.

A small pond is maintained for ornamental purposes and as a receptor for local golf course area surface drainage.

Oil-Water Separators

Eight oil-water separators are located at Keesler Air Force Base. A summary of information pertaining to these separators is contained in Table 4.4. All separators are currently connected to the sanitary sewer

TABLE 4.4
OIL-WATER SEPARATORS

Adjacent Facility	Description	Volume (gal.)	Service
6014	Auto hobby shop	3,000	Oil-water mixtures
4421	Refueling maintenance	2,000	Fuel-water mixtures
4255	1839th vehicle maintenance	2,000	Oil-water mixtures
4433	Motor pool	500	Oil-water mixtures
4254	Nose dock maintenance hangar	350	Oil-water mixtures
4205	Hangar 5 - 403rd RWRW	350	Oil-water mixtures
0251	Aircraft wash rack	6,000	Corrosion control wastes
WTP	Vehicle wash rack	3,000	Oil-water mixtures

system for disposal of water phases. Oil phases are accumulated either within the separator or in an adjacent tank for contractor removal. Routine inspection is conducted to prevent oil overflow.

Pesticide Rinse Disposal Pit

A "shell drain pit" adjacent to the Entomology Shop east of the abandoned waste treatment plant was used for a number of years prior to 1981 for disposal of pesticide rinse water and residues (see Figure 4.6). The pit provided for infiltration of the deposited materials into the soil. Although an exact volume of waste disposed is not available, it is estimated that the volume was moderate, less than 20 gallons per month.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at Keesler AFB and annexes has resulted in the identification of 21 sites which were initially considered as areas of concern with regard to the potential for contamination, as well as the potential for the migration of contaminants. These sites were evaluated using the Decision Tree Methodology referred to in Figure 1.1. Those sites which were considered as not having a potential for contamination were deleted from further consideration. Those sites which were considered as having a potential for the occurrence of contamination and migration of contaminants were further evaluated using the Hazard Assessment Rating Methodology (HARM). Table 4.5 identifies the decision tree logic used for each of the areas of initial concern.

Based on the decision tree logic, nine of the 21 sites originally reviewed did not warrant evaluation using the Hazard Assessment Rating Methodology. The rationale for omitting these nine sites from HARM evaluation is discussed below.

The two hardfill areas on base were used for disposal of construction rubble. No evidence of hazardous waste disposal at either site was found.

The two wash racks are connected to oil-water separators for the pretreatment of wastewaters prior to discharge to the sanitary sewer system. Oil phases are retained in the separators for contractor

TABLE 4.5
SUMMARY OF DECISION TREE LOGIC FOR AREAS OF INITIAL ENVIRONMENTAL CONCERN AT KEESLER AFB

Sites	Potential for Contamination	Potential for Contaminant Migration	Potential for Other Environmental Concern	HARM Rating
Landfill No. 1	Y	Y	N/A	Y
Landfill No. 2	Y	Y	N/A	Y
Landfill No. 3	Y	Y	N/A	Y
Landfill at Training Annex No. 1	Y	Y	N/A	Y
Hardfill Disposal Site No. 1	N	N	N	N
Hardfill Disposal Site No. 2	N	N	N	N
Fire Protection Training Area	Y	Y	N/A	Y
Aircraft Wash Rack	Y	N	N	N
Vehicle Wash Rack	Y	N	N	N
Transformer Storage Site	Y	Y	N/A	Y
TEL Sludge Burial Site at Training Annex No. 1	Y	Y	N/A	Y
TEL Sludge Burial Site at Landfill No. 1	Y	Y	N/A	Y
Etching Shop Pit	Y	Y	N/A	Y
Surface Impoundments	N	N	N	N
Low-Level Radioactive Waste Disposal Site	Y	Y	N/A	Y
Incinerators	N	N	N	N
Wastewater Treatment Plant	N	N	N	N
Storm Water Drainage System	N	N	N	N
Oil-Water Separators	Y	N	N	N
Pesticide Rinse Disposal Pit	Y	Y	N/A	Y
Gasoline Spill at Naval Reserve Park	Y	Y	N/A	Y

Y = Yes

N = No

N/A = Not applicable

removal. There have been no reports of contamination incidents associated with these facilities. Hence, no potential for contaminant migration exists.

Surface impoundments and the storm water drainage system have been assessed to have no potential for contamination. Hazardous wastes have not been discharged to the golf course pond, and waste discharges to the storm water system have been minimal.

The two incinerators burn only pathological wastes; no potential for environmental contamination is associated with this activity.

The wastewater treatment plant has been inactive since 1975. During its period of use, only minimal volumes of wastes other than sanitary waste were treated at the plant, so no potential for environmental contamination is associated with this site.

Oil-water separators on the base are routinely cleaned and inspected. All are maintained in good condition. Therefore no potential for contaminant migration is associated with these facilities.

The remaining twelve sites identified on Table 4.5 were evaluated using the Hazard Assessment Rating Methodology. The HARM process takes into account characteristics of potential receptors, waste characteristics, pathways for migration, and specific characteristics of the site related to waste management practices. The details of the rating procedures are presented in Appendix G. Results of the assessment for the sites are summarized in Table 4.6. The HARM system is designed to indicate the relative need for follow-on action. The information presented in Table 4.6 is intended for assigning priorities for further evaluation of the Keesler AFB disposal areas (Section 5, Conclusions and Section 6, Recommendations). The rating forms for the individual waste disposal sites at Keesler AFB are presented in Appendix H. Photographs of some of the disposal sites are included in Appendix F.

TABLE 4.6
SUMMARY OF HARM SCORES FOR POTENTIAL
CONTAMINATION SOURCES
KEESLER AFB

Rank	Site	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Etching Shop Drainage Pit	61	72	88	1.00	74
2	Fire Protection Training Area	62	64	88	1.00	71
3	Landfill No. 2	66	48	88	1.00	67
4	Transformer Storage Site	57	60	67	1.00	61
5	Pesticide Rinse Disposal Pit	56	54	74	1.00	61
6	TEL Sludge Burial Site in Landfill No. 1	57	45	81	0.95	58
7	TEL Sludge Burial Site at Training Annex No. 1	61	45	70	0.95	56
8	Landfill No. 3	62	8	88	1.00	53
9	Landfill No. 1	57	8	81	1.00	49
10	Landfill at Training Annex No. 1	66	8	70	1.00	48
11	Gasoline Spill at Naval Reserve Park	62	72	88	0.1	7
12	Low-level Radioactive Waste Burial Site	57	30	81	0.1	6

SECTION 5

CONCLUSIONS

The goal of the IRP Phase I study is to identify sites having the potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on field inspections, review of records and files, review of the environmental setting, and interviews with base personnel, past employees, and federal, state, and local government employees. Table 5.1 contains a list of the potential contamination sources identified at Keesler AFB and a summary of the HARM scores for those sites is presented below. The follow-on recommendations are presented in Chapter 6.

ETCHING SHOP DISPOSAL PIT

There is sufficient evidence that the Etching Shop Disposal Pit site has potential for creating environmental contamination and a follow-on investigation is warranted. For a number of years, wastes from the Etching Shop were piped to this pit, which consisted of three buried 55-gallon drums and a French drain which served as a leaching bed. The waste materials disposed of in the pit include acids, and organic solvents. The site is located in sandy soils and the water table is shallow. This site received a HARM score of 74, primarily because of the high waste characteristics and pathways scores.

FIRE PROTECTION TRAINING AREA

There is sufficient evidence that the Fire Protection Training Area site has potential for creating environmental contamination and a follow-on investigation is warranted. This site has been in continuous use as a fire training site since the mid-1950's. Prior to 1981, the training exercises were conducted on an earthen base with an earthen dike surrounding the site. No underdrains, oil-water separators, or unburned fuel reclamation

TABLE 5.1
SITES EVALUATED USING THE
HAZARD ASSESSMENT RATING METHODOLOGY FORMS
KEESLER AIR FORCE BASE

Rank	Site	Operating Period	Final Harm Score
1	Etching Shop Drainage Pit	1941 - 1981	74
2	Fire Protection Training Area	1955-Present	71
3	Landfill No. 2	Late 1940's	67
4	Transformer Storage Site	1960's- 1972	61
5	Pesticide Rinse Disposal Pit	1960's- 1981	61
6	TEL Sludge Burial Site in Landfill No. 1	1942	58
7	TEL Sludge Burial Site in Training Annex No. 1	1970	56
8	Landfill No. 3	1950 - 1974	53
9	Landfill No. 1	1941 - 1950	49
10	Landfill at Training Annex No. 1	1968 - 1971	48
11	Gasoline Spill at Naval Reserve Park	1983	7
12	Low-level Radioactive Waste Burial Site	1950's- 1960	6

and storage facilities were associated with this site until 1981. The site was surrounded by Landfill No. 3. Both areas are located in sandy soils with a shallow water table, in close proximity to Back Bay and its potential flood zone. The site received a HARM score of 71, primarily because of the waste characteristics, duration of site use, and waste receptor pathways.

LANDFILL NO. 2

There is sufficient evidence that the Landfill No. 2 site has potential for creating environmental contamination and a follow-on investigation is warranted. Landfill No. 2 was used during the late 1940's for disposal of normal base refuse, as well as for waste paints, paint cans, and paint solvents. Burning occurred at the site routinely. The soil in the area is sandy and the water table is shallow. The site is located in close proximity to Back Bay and is situated within the potential flood zone. The site received a HARM score of 67, because of the waste characteristics and waste receptor pathways.

TRANSFORMER STORAGE SITE

There is sufficient evidence that the Transformer Storage Site has potential for creating environmental contamination and a follow-on investigation is warranted. Out-of-service electrical transformers were stored at a gravelled area at the southeastern base boundary for a number of years prior to and including 1972. Small spills of dielectric fluid occurred onto the ground at the site over the years. Use of the site was discontinued in 1972. The site is underlain by sandy soils and a shallow water table. This site received a HARM score of 61, primarily because of the waste characteristics and waste receptors pathways.

PESTICIDE RINSE DISPOSAL PIT

There is sufficient evidence that the Pesticide Rinse Disposal Pit site has potential for creating environmental contamination and a follow-on investigation is warranted. Approximately 20-gallons per month or less of rinse water were disposed of in this leaching pit for at least 15 years prior to 1981. The wastes consisted of rinse waters from pesticide preparation and excess diluted pesticides. Use of the site was discontinued in 1981. The site is covered by gravel, is located in a level area, underlain by sandy soils and a high water table. A strong migration potential exists. This site received a HARM score of 61, primarily because of waste characteristics and waste receptor pathways.

TEL SLUDGE BURIAL SITE IN LANDFILL NO. 1

There is sufficient evidence that the Tetraethyl Lead (TEL) Sludge Burial Site in Landfill No. 1 has potential for creating environmental contamination and a follow-on investigation is warranted. TEL sludge in unknown quantities and in containers of unknown type was buried near the north end of Landfill No. 1 in or about 1942. This site is presently a part of the base golf course. The site is located in a level, sandy area with a shallow-water table. The site received a HARM score of 58, primarily because of the waste characteristics and waste receptor pathways.

TEL SLUDGE BURIAL SITE AT TRAINING ANNEX NO. 1

There is sufficient evidence that the TEL Sludge Burial Site at Training Annex No. 1 has potential for creating environmental contamination and a follow-on investigation is warranted. Three 55-gallon drums of TEL sludge were buried at this site in 1970. The site is located in a level, sandy area with a shallow water table. This site received a HARM score of 56, primarily because of the waste characteristics and waste receptor pathways.

LANDFILL NO. 3

There is sufficient evidence that the Landfill No. 3 site has potential for creating environmental contamination and a follow-on investigation is warranted. Landfill No. 3 was used as a refuse dump from 1950 until 1975. A wide variety of base-generated waste materials was disposed of in this landfill. The fire protection training area site is located in the center of the landfill area. The fact that the fire protection training area required follow-on investigation and that the landfill and the fire protection training area could not be separated in follow-on investigations caused follow-on investigations to be recommended at this site. The site is located in a level, sandy area with a shallow water table. The site is located in the potential flood zone of Back Bay. The site received a HARM score of 53, primarily because of the waste receptor pathways.

LANDFILL NO. 1

There is sufficient evidence that the Landfill No. 1 site has potential for creating environmental contamination and a follow-on investigation is warranted. Landfill No. 1 was used from the early 1940's until 1950. Normal base refuse was deposited in the landfill. This landfill was closed in 1950, was covered during the early 1950's, and is the site of the present base golf course. The site is located in a level, sandy area with a shallow water table. TEL sludge burial was conducted in the former landfill and this fact causes follow-on investigation to be recommended. Soil permeabilities in the area are likely increased because of the existence of the landfill. This site received a HARM score of 49, primarily because of the waste characteristics and waste receptor pathways.

LANDFILL AT TRAINING ANNEX NO. 1

There is not sufficient evidence that the Landfill at Training Annex No. 1 site has potential for creating environmental contamination and a follow-on investigation is not warranted. This site was used for disposal of base refuse from 1968 until 1971. There was no evidence of hazardous waste disposal at this site. The site received a HARM score of 48, primarily because of the lack of hazardous waste disposal at the site.

GASOLINE SPILL SITE AT NAVAL RESERVE PARK

There is not sufficient evidence that the Gasoline Spill Site at the Naval Reserve Park has potential for creating environmental contamination and a follow-on investigation is not warranted. The spill, totaling approximately 1,400 gallons, was promptly discovered and reclamation and cleanup activities were begun immediately. Monitoring of the waters of the Back Bay of Biloxi and from monitoring wells indicated the extent of contamination and remedial measures needed. Cleanup was accomplished in a timely manner. The site received a HARM score of 7, primarily because the cleanup activities warranted a low waste management practices factor of 0.1.

LOW-LEVEL RADIOACTIVE WASTE DISPOSAL SITE

There is not sufficient evidence that the Low-level Radioactive Waste Disposal Site has potential for creating environmental contamination and a follow-on investigation is not warranted. This site consists of a buried concrete vault containing low-level radioactive waste materials. The vault was installed in the mid-1950's and disposal continued until about 1960. The site is presently covered and is part of the base golf course. The site received a HARM score of 6, primarily because containment activities at the site warranted a low waste management practices factor of 0.1.

SECTION 6
RECOMMENDATIONS

Twelve sites were identified at Keesler AFB as having the potential for environmental contamination. These sites have been evaluated using the HARM system which assesses their relative potential for contamination and provides the basis for determining the need for additional Phase II, IRP investigation. Nine of the sites have sufficient potential to create environmental contamination and Phase II investigations are recommended. All sites have been reviewed with regard to land use restrictions which may be applicable.

PHASE II MONITORING

The subsequent recommendations are made to further assess the potential for environmental contamination from waste disposal areas at Keesler AFB. The recommended actions are generally one-time sampling programs to determine if contamination does exist at the site. If contamination is identified, the sampling program should be expanded to define the extent of contamination. The recommended monitoring program, including analytical parameters, is summarized in Table 6.1. Figure 6.1 illustrates the proposed Phase II monitoring locations. The proposed sampling locations are based upon consideration of local soil and surface water condition. Environmental sampling may consist of the following procedures:

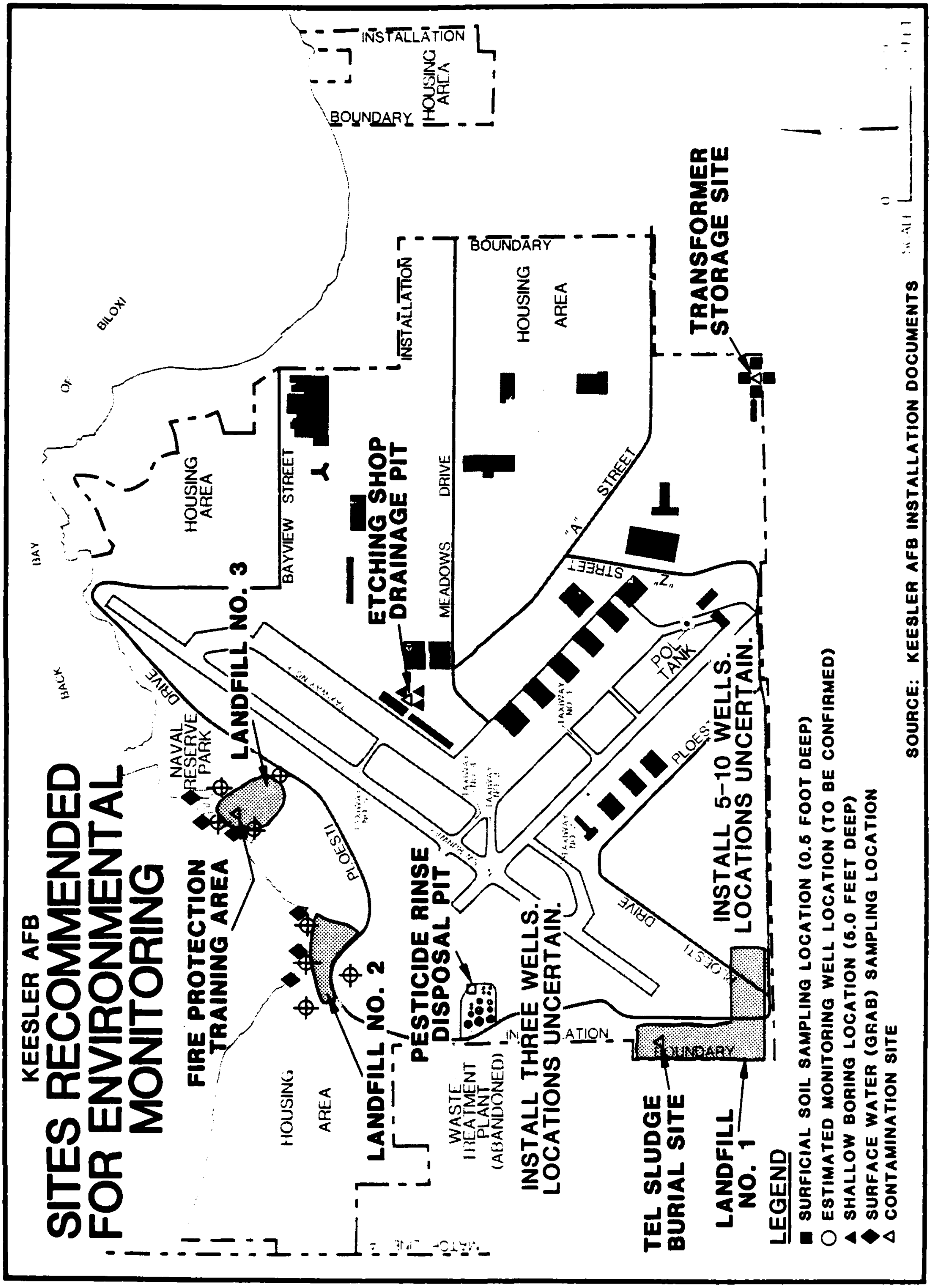
1. Stream (grab) sampling at strategically selected locations during low-flow conditions and analysis for certain indicator parameters.
2. Surficial soil sampling (no deeper than six inches below surface) and analysis for certain indicator parameters.

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II
IRP AT KEESLER AFB

Area/Site (Rating Score)		Recommended Monitoring[1]	Recommended Analytical Parameters
Etching Shop Drainage Pit	(74)	Drill three borings ten feet deep at selected locations. Sample at 10', 8' and 6' intervals. Perform water extraction on samples for analyses.	pH Total Dissolved Solids Oil and Grease Total Organic Carbon Phenols Lead Chromium
Fire Protection Training Area and Landfill No. 3	(71)[2] (53)[2]	Install monitoring wells at four locations. Collect and analyze groundwater samples from four locations and surface water samples at three locations.	pH Total Dissolved Solids Oil and Grease Total Organic Carbon Total Organic Halogens Phenols Lead
Landfill No. 2	( )	Install monitoring wells at four locations. Obtain surface water samples at three locations.	pH Total Dissolved Solids Oil and Grease Total Organic Carbon Total Organic Halogens Phenols Lead Chromium
Transformer Storage Site	(61)	Perform surficial (0.5 foot deep) soil sampling four locations around the site. Analyze soil samples.	pH Oil and Grease Total Organic Halogens PCB's
Pesticide Rinse Disposal Pit	(59)	Install three monitoring wells around site. Determine locations in the field. Collect and analyze ground water samples.	pH Total Dissolved Solids Total Organic Carbon Total Organic Halogens Diazinon Dursban-M Malathion Chlordane Lindane
TFL Sludge Burial Site at Training Annex No. 1	(58)[2]	Install monitoring wells at three locations. Collect and analyze ground water samples.	pH Total Dissolved Solids Oil and Grease Total Organic Carbon Total Organic Halogens Phenols Lead Chromium
TFL Sludge Burial Site at Landfill No. 1	(56)	Install five to ten monitoring wells around site. Determine locations in the field. Collect and analyze ground water samples.	pH Total Dissolved Solids Oil and Grease Total Organic Carbon Total Organic Halogens Phenols Lead Chromium

[1] See Figure 6.1 for recommended monitoring locations.
[2] Consider two sites together as a single potential contaminant source.

FIGURE 6.1



ES ENGINEERING-SCIENCE

3. Shallow soil boring (five feet deep), sampling at one foot intervals (five samples per boring) and analysis for selected indicator parameters.
4. The installation of monitoring wells into the uppermost aquifer at strategically selected locations.

Geophysical techniques have not been recommended for use at this installation for several reasons including the expected high chloride content in surficial soils and the proximity of some sites to area surface waters and to each other. Chloride-containing soils may tend to degrade the performance of geophysical instruments, while the proximity to other sites and the streams could make data interpretation questionable.

The recommended environmental monitoring programs for those sites receiving comparatively high HARM scores follows. It is noted that the environmental monitoring program recommended for some sites considers that two sites be monitored as a single unit. This action has been used in situations where a second disposal site has been constructed into a pre-existing facility. In this situation, the two cannot be conveniently separated for the purposes of environmental monitoring.

RECOMMENDATIONS

Etching Shop Drainage Pit

This disposal facility was designed to leach waste fluids into the ground and was used from the early 1970's until 1981. The site is now closed and covered. The environmental setting of the site consists of sandy soil (beneath the existing cover) and shallow water levels. Three shallow soil borings, approximately ten feet deep, should be advanced using a hollow stem auger or similar process at the locations shown on Figure 6.1. Water extractions should be performed on samples at 10, 8, and 6 feet and should be analyzed for the selected indicator parameters listed in Table 6.1. Ground-water monitoring is not recommended at this time, due to the paving and building proximity.

Fire Protection Training Area and Landfill No. 3

The Fire Protection Training Area has been constructed in the midst of Landfill No. 3 at a location between Ploesti Drive and the Back Bay. It would be impractical to consider these two sites separately. The local environmental setting includes generally sandy soils, a high water table and a major surface water subject to tidal influences. Ground-water monitoring is recommended at the four approximate locations shown on Figure 6.1. One well is located hydraulically upgradient, and three wells are located downgradient. It is presumed that the predominant flow direction in the shallow aquifer is toward Back Bay. This may change locally due to tidal impacts. The actual locations of monitoring wells must be determined in the field, with respect to the sites and true shallow aquifer flow. Monitoring wells should be constructed of (minimum) two-inch diameter PVC solid-wall casing, mechanically fitted to five-foot long machine-slotted screen. The well assembly will range in total length from ten to twenty feet and must be adequately sealed into the uppermost aquifer in order to permit the acquisition of representative ground-water samples. Three one-time surface water (grab) samples should be taken in tidal waters immediately adjacent to the site, at the locations depicted on Figure 6.1. All water samples should be analyzed for the parameters listed in Table 6.1.

Landfill No. 2

Landfill No. 2 has a high potential to produce and permit the migration of hazardous waste related constituents into the adjacent environment. Monitoring of ground-water and surface-water quality should consist of monitoring well installation and grab sampling of surface water, to be performed at the approximate locations shown on Figure 6.1. Well installation procedures should (as a minimum) be similar to those previously described. One well should be installed hydraulically upgradient and three wells constructed downgradient. Thus, actual well locations can only be determined in the field, once the real shallow-aquifer and the flow of water within it are defined. All water samples should be analyzed for the parameters listed in Table 6.1.

Transformer Storage Site

Spillage of PCB-contaminated oil may have occurred at this site. In order to determine if this has happened, surficial soil sampling at the four locations depicted on Figure 6.1 are recommended. Deeper soil sampling and ground-water monitoring are not suggested at this time, as it is unlikely that PCB-related contamination will migrate further. Soil samples should be tested for the pollutants listed in Table 6.1.

Pesticide Rinse Disposal Pit

This facility was designed to leach liquid wastes into sandy surface soils, which also possess shallow water levels. A ground-water monitoring system, consisting of three wells, should be installed around the site, using the previously described construction details. The locations of the wells must be based upon local shallow aquifer characteristics, which must be determined in the field, at the time drilling is performed. Ground-water samples should be analyzed for the parameters listed in Table 6.1.

TEL Sludge Burial Site at Training Area No. 1

It is recommended that three two-inch PVC monitoring wells be installed at the approximate locations depicted on Figure 6.1. The actual true well locations must be determined in the field, considering to local shallow aquifer flow conditions and the subject site. Wells must have solid wall casing mechanically fitted to a five foot length of machine-slotted PVC screen, adequately sealed into the uppermost aquifer. The well length will range from ten to twenty feet; well construction should be consistent with previously described recommendations. Ground water samples should be obtained and analyzed for the parameters listed in Table 6.1.

TEL Sludge Burial Site and Landfill No. 1

These two sites must be considered as a single potential source of environmental contamination. Due to the size and geometry of the area under consideration, it is recommended that five to ten two-inch diameter wells be installed around the site. Well locations must be determined in the field, as shallow aquifer characteristics are not well defined nor easily estimated for this particular location. Well construction should be similar to that previously described. Ground-water samples should be analyzed for the parameters listed in Table 6.1.

RECOMMENDED GUIDELINES FOR LAND USE RESTRICTIONS

It is desirable to have land use restrictions for the identified sites to (1) provide continued protection of human health, welfare, and the environment, (2) insure that migration of potential contaminants is not promoted through improper land uses, (3) facilitate compatible development of future USAF facilities, and (4) allow identification of property which may be proposed for excess or outlease.

The recommended guidelines for land use restrictions at each identified disposal site at Keesler AFB are presented in Table 6.2. A description of the land use restriction guidelines is included in Table 6.3. Land use restrictions at sites recommended for on-site monitoring should be reevaluated upon completion of the Phase II program and appropriate changes made.

TABLE 6.2
RECOMMENDED GUIDELINES AT POTENTIAL CONTAMINATION SITES FOR LAND USE RESTRICTIONS
KEESLER AIR FORCE BASE

Site	Recommended Guidelines for Future Land Use Restrictions[1]											
	Construction on the Site	Excavation	Well Construction on or near the Site	Agricultural Use	Silvicultural Use	Water Infiltration (run-on, Ponding, Irrigation)	Recreational Use	Burning or Ignition Source	Disposal Operations	Vehicular Traffic	Material Storage	Housing on or Near the Site
Landfill No. 1	R	R	R	NR	NR	R	NR	R	R[2]	NR	NR[3]	R
Landfill No. 2	R	R	R	NR	NR	R	R	R	R[2]	NR	NR[3]	R
Landfill No. 3	R	R	R	NR	NR	R	R	R	R[2]	NR	NR[3]	R
Landfill at Training Area No. 1	R	R	R	NR	NR	R	R	R	R[2]	NR	NR[3]	R
TEL Burial at Training Area	R	R	R	R	R	R	R	R	R	R	R	R
TEL Burial at Landfill No. 1	R	R	R	R	R	R	R	R	R	R	R	R
Transformer Storage	R	R	R	R	R	R	R	R	R	R	R	R
Gasoline Spill	NR	NR	R	NR	NR	R	NR	R	R	NR	NR	NR
Radioactive Waste Site	NR	R	R	NR	NR	R	NR	R	R[2]	NR	NR	R
FPTA	R	R	R	R	R	R	R	R	R	R	R	R
Etching Shop Drainage Pit	R	R	R	R	R	R	R	R	R	R	R	R
Pesticide Rinse Pit	R	R	R	R	R	R	R	R	R	R	R	R

[1] See Table 6.3 for description of guidelines.
Note the following symbols in this table:
R = Restrict the use of the site for this purpose
NR = No restriction of the site for this purpose

[2] Restrict for all wastes except for construction/demolition debris.

[3] No restriction on solid materials but liquids undesirable.

Source: Engineering-Science

TABLE 6.3
DESCRIPTION OF GUIDELINES FOR LAND-USE RESTRICTIONS

Guideline	Description
Construction on the site	Restrict the construction of structures which make permanent (or semi-permanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site, based on prevailing soil conditions and ground-water flow.
Agricultural use	Restrict the use of the site for agricultural purposes to prevent food chain contamination.
Silvicultural use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials).
Water infiltration	Restrict water run-on, ponding and/or irrigation of the site. Water infiltration could produce contaminated leachate..
Recreational use	Restrict the use of the site for recreational purposes.
Burning or ignition sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.
Material storage	Restrict the storage of any and all liquid or solid materials on the site.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

APPENDICES
TABLE OF CONTENTS

APPENDIX A

BIOGRAPHICAL DATA

BIOGRAPHICAL DATA

Eric Heinman Snider

Senior Chemical Engineer

PII Redacted

[redacted]

Education

B.S. in Chemistry (Magna Cum Laude), 1973, Clemson University, Clemson, S.C.
M.S. in Chemical Engineering, 1975, Clemson University, Clemson, S.C.
Ph.D. in Chemical Engineering, 1978, Clemson University, Clemson, S.C.

Professional Affiliations

Registered Professional Engineer (Oklahoma No. 13499, Georgia No. 14228)
American Institute of Chemical Engineers
American Chemical Society
American Society for Engineering Education
Certified Professional Chemist, A.I.C. (1975)

Honorary Affiliations

Sigma Xi
Tau Beta Pi
Phi Kappa Phi
Who's Who in the South and Southwest, 1981
Outstanding Young Men of America, 1983

Experience Record

1971-1975 Texidyne, Inc., Clemson, S.C., Staff Chemist. Responsible for routine and specialized chemical analyses for water, wastewater, solid wastes, and air pollution testing. Experience in gas chromatography, atomic absorption, microbiological testing.

1975-1978 Texidyne, Inc., Clemson, S.C., Part-time Consultant. Responsible for overall management of laboratory facilities and some wastewater engineering studies. Also ran incinerator performance studies.

Eric H. Snider (Continued)

1976-1977 Clemson University, Clemson, S.C., Chief Analyst on airborne fluoride monitoring project in Chemical Engineering Department, performed for Owen-Corning Fiberglas Corp., Toledo, Ohio.

1978-1982 The University of Tulsa, Tulsa, OK., Assistant Professor of Chemical Engineering and Associate Director, University of Tulsa Environmental Protection Projects (UTEPP) Program. Normal teaching duties; research centered on specialized petroleum refinery problems of water and solid wastes and oil-water emulsions. Supervised an industry-sponsored research program in the area of oil-water emulsion breaking technologies.

1982-1983 The University of Tulsa, Tulsa, OK., Associate Professor of Chemical Engineering and Director of UTEPP Program. Normal teaching duties; researched and wrote five monographs on environmental areas; including, incineration, flotation, gravity separation, screening/sedimentation, and equalization.

1983-Date Engineering-Science, Senior Engineer. Responsible for a wide variety of waste treatment, chemical process, resource recovery, energy, incineration and air pollution control activities for industrial, governmental and local municipal clients. Recent activities include incineration evaluation for a toxic chemical disposal facility to be operated by the U.S. Army on Johnston Atoll, investigation of the breaking of oil/water emulsions from an industrial process discharge, analytical verification of oil residues in contaminated ground water at a hazardous waste disposal site and evaluation of alternative treatment technologies for a new pharmaceutical production facility including vapor re-compression evaporation, incineration, biological oxidation and various air pollution control systems. Particularly strong technical areas include waste treatment chemistry, incineration, analytical trouble-shooting, R&D and resource recovery technologies including energy recovery.

Publications

Snider, E.H., and J.J. Porter: Ozone Destruction of Selected Dyes in Wastewater, Am Dyestuff Rep., 63 (8), 36-48, 1974.

Porter, J.J., and E.H. Snider: Thirty Day Biodegradability of Textile Chemicals and Dyes, Book of Papers of 1974 National Technical Conference of AATCC, 427-436 (1974).

Snider, E.H., and J.J. Porter: Ozone Treatment of Dye Waste, J. Water Pollut. Control Fed., 46, 886-894, 1974.

Porter, J.J., and E.H. Snider: Long Term Biodegradability of Textile Chemicals, J. Water Pollut. Control Fed., 48, 2198-2210, 1976.

Snider, E.H., and J.J. Porter: Comparison of Atmospheric Hydrocarbon Levels with Air Quality Standards, Am. Dyestuff Ref., 65 (8), 22-31, 1976.
Snider, E.H.: Organization of a Functional Chemical Engineering Library; Chem. Eng. Ed., 11 (1), 44-48, 1977.

Snider, E.H., and F.C. Alley: Kinetics of the Chlorination of Biphenyl Under Conditions of Waste Treatment Processes, Env. Sci. Tech., 13, 1244-1248 (1979).

Snider, E.H. and F.C. Alley: Kinetics of Biphenyl Chlorination in Aqueous Systems in the Neutral and Alkaline pH Ranges, Chapter 21 in Proceedings Third Conference on Chlorination, Ann Arbor Science Publishers, Inc., Ann Arbor, MI, 1980.

Sublette, K.L., E.H. Snider, and N.D. Sylvester: Powdered Activated Carbon Enhancement of the Activated Sludge Process: A Study of the Mechanisms, in Proceedings of the Eighth Annual Water and Wastewater Equipment Manufacturers Association (WWEMA) Industrial Pollution Conference, pp. 351-369, 1980.

Snider, E.H.: "Chemical Engineering Laboratory Courses at The University of Tulsa: Improving the Communication of Technical Results," in Proceedings of the Fifteenth Midwest Section Conference of ASEE, pp. IIB28-IIB35, 1980.

Snider, E.H.: "Chemical Engineering Laboratory Experiment: Mass Transfer Tray Hydraulics," in Proceedings of 16th Midwest Section Conference of ASEE, pp. II A-9 - II A-16, 1981.

Snider, E.H.: "Chemical Engineering Laboratory Experiment: Mass Transfer Tray Hydraulics," in Proceedings of 1981 ASEE National Meeting, Vol. II, pp. 360-363, 1981.

Snider, E.H. and F.S. Manning: "A Survey of Pollutant Emission Levels in Wastewaters and Residuals from the Petroleum Refining Industry," Env. International, Vol. 7, pp. 237-258, 1982.

Sublette, K.L., E.H. Snider and N.D. Sylvester: "A Review of the Mechanism of Powdered Activated Carbon Enhancement of Activated Sludge Treatment," Water Research, 16, 1075-1082 (1982).

Books; Monographs; Chapters

Manning, F.S., and E.H. Snider; "Equalization," Invited Monograph in Series on Wastewater Treatment Technology, W.W. Eckenfelder and J.W. Patterson, ed., 1981.

Ford, D.L., F.S. Manning, and E.H. Snider: "Flotation," Invited Monograph in Series on Wastewater Treatment Technology, W.W. Eckenfelder and J.W. Patterson, ed., 1981.

Manning, F.S., and E.H. Snider; "Oil and Grease Removal by Gravity," Invited Monograph in Series on Wastewater Treatment Technology, W.W. Eckenfelder and J.W. Patterson, ed., 1981.

Manning, F.S., and E.H. Snider; "Incineration: Wastewater Treatment Applications," Invited Monograph in Series on Wastewater Treatment Technology, W.W. Eckenfelder and J.W. Patterson, ed., 1981.

Manning, F.S., E.H. Snider, and E.L. Thackston: "Screening and Sedimentation," Invited Monograph in Series on Wastewater Treatment Technology, W.W. Eckenfelder and J.W. Patterson, ed., 1981.

Short Courses and Presentations

January 1974	Presentation of paper, "Comparison of Existing Air Pollution Levels with Standards," Third Annual Conference on Textile Wastewater and Air Pollution Control, Hilton Head Island, S.C.
May 1974	Presentation of paper, "Thirty Day Biodegradability of Textile Chemicals and Dyes," 1974 Annual Technical Conference of American Association of Textile Chemists and Colorists, New Orleans, LA.
June 1977	Presentation, "Air Pollution Instrumentation"; Short Course on Industrial Pollution Control, Clemson University, Clemson, S.C.
June 1977	Presentation, "Industrial Sludge Treatment and Disposal"; Short Course on Industrial Pollution Control, Clemson University, Clemson, S.C.
October 1977	Presentation, "A Kinetic Study of the Reactions of Biphenyl and Chlorine in Water to Form Chlorobiphenyls"; Chem. Eng. Dept. seminar, Clemson University, Clemson, S.C.
January 1978	Presentation of paper, "Carbon Adsorption for Removal of Gaseous Pollutants," 1978 Technical Meeting of American Association of Textile Chemists and Colorists, New York, N.Y.
January 1978	Presentation of paper, "Carbon Adsorption for Removal of Gaseous Pollutants," The University of Tulsa, Tulsa, OK.
June 1980	Presentation of paper, "Powdered Activated Carbon Enhancement of the Activated Sludge Process," Eighth Annual Meeting of the Water and Wastewater Treatment Manufacturers Association, Austin, TX.

Eric H. Snider (Continued)

June 1981	Presentation of paper, "The Valve Tray Column: An Experiment in Tray Hydraulics," Annual National Meeting of Am. Soc. for Engr. Education, Los Angeles, CA.
March 1982	Presentation of paper, "PAC Enhancement of the Activated Sludge Process," Chem. Engr. Dept. seminar series, University of Oklahoma, Norman, OK.

Biographical Data

JOHN R. ABSALON
Hydrogeologist

PII Redacted

[redacted]

Education

B.S. in Geology, 1973, Upsala College, East Orange, New Jersey

Professional Affiliations

Certified Professional Geologist (Indiana No. 46)
Association of Engineering Geologists
Geological Society of America
National Water Well Association

Experience Record

1973-1974 Soil Testing Incorporated-Drilling Contractors, Seymour, Connecticut. Geologist. Responsible for the planning and supervision of subsurface investigations supporting geotechnical, ground-water contamination, and mineral exploitation studies in the New England area. Also managed the office staff, drillers, and the maintenance shop.

1974-1975 William F. Loftus and Associates, Englewood Cliffs, New Jersey. Engineering Geologist. Responsible for planning and management of geotechnical investigations in the northeastern U.S. and Illinois. Other duties included formal report preparation.

1975-1978 U.S. Army Environmental Hygiene Agency, Fort Mc-Pherson, Georgia. Geologist. Responsible for performance of solid waste disposal facility siting studies, non-complying waste disposal site assessments, and ground-water monitoring programs at military installations in the southeastern U.S., Texas, and Oklahoma. Also responsible for operation and management of the soil mechanics laboratory.

1978-1980 Law Engineering Testing Company, Atlanta, Georgia. Engineering Geologist/Hydrogeologist. Responsible for the project supervision of waste management, water quality assessment, geotechnical, and hydrogeologic studies at commercial, industrial, and government

10.22
John R. Absalon (Continued)

facilities. General experience included planning and management of several ground-water monitoring programs, development of remedial action programs, and formulation of waste disposal facility liner system design recommendations. Performed detailed ground-water quality investigations at an Air Force installation in Georgia, a paper mill in southwestern Georgia, and industrial facilities in Tennessee.

1980-Date Engineering-Science. Hydrogeologist. Responsible for supervising efforts in waste management, solid waste disposal, ground-water contamination assessment, leachate generation, and geotechnical and hydrogeologic investigations for clients in the industrial and governmental sectors. Performed geologic investigations at twenty Air Force bases and other industrial sites to evaluate the potential for migration of hazardous materials from past waste disposal practices. Conducted RCRA ground-water monitoring studies for industrial clients and evaluated remedial action alternatives for a county landfill in Florida. Conducted quality management, hydrogeologic and ground-water quality programs for the pulp and paper industry at several mills located in the Southeast United States.

Publications and Presentations

"An Investigation of the Brunswick Formation at Roseland, NJ," 1973, with others, The Bulletin, Vol 18, No. 1, NJ Academy of Science, Trenton, NJ.

"Engineering Geology of Fort Bliss, Texas," 1978, coauthor: R. Barksdale, in Terrain Analysis of Fort Bliss, Texas, US Army Topographic Laboratory, Fort Belvoir, VA.

"Geologic Aspects of Waste Disposal Site Evaluations," 1980, with others, Program and Abstracts AEG-ASCE Symposium on Hazardous Waste Disposal, April 26, Raleigh, NC.

"Practical Aspects of Ground-Water Monitoring at Existing Disposal Sites," 1980, coauthor: R.C. Starr, Proceedings of the EPA National Conference on Management of Uncontrolled Hazardous Sites, HMCRI, Silver Spring, MD.

"Improving the Reliability of Ground-Water Monitoring Systems," 1981, Proceedings of the Madison Conference of Applied Research and Practice on Municipal and Industrial Waste, University of Wisconsin-Extension, Madison, WI.

10.22
John R. Absalon (Continued)

Ground-Water Monitoring Workshop, 1982. Presented to Mississippi Bureau of Pollution Control, Jackson, 15-17 February.

Ground-Water Monitoring Workshop, 1982. Presented to Alabama Division of Solid and Hazardous Waste, Huntsville, 20-21 July.

Ground-Water Monitoring Workshop, 1982. Presented to Kentucky Waste Management Division, Bowling Green, 27-28 July.

"Identification and Treatment Alternatives Evaluation for Contaminated Ground Water," 1982, coauthor: M. R. Hockenbury. Presented to Association of Engineering Geologists Symposium on Hazardous Waste Disposal, Atlanta, 17 September.

"Preliminary Assessment of Past Waste Storage and Disposal Sites," 1982, coauthor: W. G. Christopher. Presented to Association of Engineering Geologists Symposium on Hazardous Waste Disposal, Atlanta, 17 September.

"Treatment Alternatives Evaluation for Aquifer Restoration," 1983, coauthor: M. R. Hockenbury, Proceedings of the Third National Symposium on Aquifer Restoration and Ground Water Monitoring, NWWA, Worthington, OH.

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Biographical Data

ROBERT J. REIMER

PII Redacted

Chemical Engineer

[redacted]

Education

B.S. in Chemical Engineering, 1979, University of Notre Dame
B.A. in Art, 1979, University of Notre Dame
M.S. in Chemical Engineering, 1980, University of Notre Dame

Honors

Amoco Company Fellowship for Graduate Studies in Chemical Engineering, University of Notre Dame (1979-1980)

Professional Affiliations

American Institute of Chemical Engineers

Experience Record

1978-1979 PEDCo Environmental, Cincinnati. Engineer's Assistant. Responsible for compilation of data base report reviewing solid waste disposal in the nonferrous smelting industry. Participated in SO_2 scrubber emissions testing program, Columbus, Ohio. Worked on team establishing a computerized reference file on the overall smelting industry. Performed technical editing and report review.

1979-1980 Camargo Associates, Ltd., Cincinnati. Design Engineer and Draftsman. Responsible for HVAC design on numerous projects. Designed fire protection system for an industrial plastics press. Designer on various general plumbing jobs. Prepared EPA air pollution permit applications.

1980-Date Engineering-Science. Chemical Engineer. Responsible for the preparation of environmental reports and permit documents as well as providing general environmental assistance to clients to assure compliance with state and federal regulations.

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Robert J. Reimer (Continued)

1980-Date Developed cost estimates for several hazardous waste management facility closures. Prepared several Interim Status Standards Manuals, including Manifest Plans, Waste Analysis Plans, Closure Plans and Contingency/ Emergency Plans. Provided technical assistance in the design of a one-million gallon per year fuel alcohol production facility.

Provided assistance for a water reuse/reduction plan at a major petroleum refinery. Conducted an extensive review of emerging energy technologies for the Department of Energy. Participated in several Installation Restoration Programs for the U. S. Air Force. Assisted in the design of a contaminated ground water air stripping column based on a lab model to be developed. Prepared several delisting petitions for the removal of industrial wastestreams from EPA's hazardous waste list. Assisted in a study of waste oil reuse for the U.S. Army CERL.

APPENDIX B

LIST OF INTERVIEWEES AND OUTSIDE AGENCIES

TABLE B.1
LIST OF INTERVIEWEES

	Position	Years of Service at This Installation
1.	Civilian, Environmental Protection Specialist	17
2.	Civilian, Instructor Communications/Electronics	11
3.	Civilian, Real Property Officer	17
4.	Civilian, Center Historian	19
5.	NCO, Assistant Center Historian	1
6.	Civilian, Equipment Operator, Retired	12
7.	Civilian, Superintendent of Roads and Grounds, Retired	30
8.	Civilian, Property Marketing Specialist, DPDO	11
9.	Civilian, Estimator/Planner, C.E.	34
10.	Civilian, Equipment Operator	28
11.	Civilian, Chief of DPDO	7
12.	Civilian, Chief of DPDO, Retired	29
13.	Civilian, Supervisory Engineering Technician	17
14.	Civilian, Wood Crafter	42
15.	Civilian, Training Devices Painter	42
16.	Civilian, Civil Engineer	4
17.	NCOIC, Fuels Management	3
18.	NCO, Fuels Management	3
19.	Civilian, Fuels Management	4
20.	NCOIC, Entomology	2

TABLE B.1
(Continued)
LIST OF INTERVIEWEES

Position	Years of Service at This Installation
21. Civilian, Entomology	4
22. Chief, Fire Department	5
23. Civilian, Fire Department	12
24. Base Bioenvironmental Engineer	2
25. NCOIC, BES	3
26. NCO, Corrosion Control, FMS	2
27. NCO, General Vehicle Maintenance, TRANS	2
28. NCO, Engine Shop, FMS	3
29. NCO, POL Maintenance, CE	1
30. NCO, Inspecion Deck OMS	1
31. Civilian, Water and Wastewater Superintendent	2
32. Civilian, Environmental Protection Specialist, Retired	23

TABLE B.2
LIST OF OUTSIDE AGENCIES

	Agency	Point of Contact
1.	Superintendent, City of Biloxi Water Department 419 Main Street Biloxi, MS 39533 601/432-0338	Curtis Higginbotham
2.	Hydrologist Chief, Ground-Water Section U.S. Geological Survey, Water Resources Division Federal Building, Suite 710 100 West Capitol Street Jackson, MS 39269 601/960-4600	Bobby Richards Ernest H. Boswell
3.	Conservationist U.S. Department of Agriculture,Soil Conservation Service Milner Building, Room 590 210 South Lamar Street (P.O. Box 610) Jackson, MS 39205 601/960-4341	W. I. Smith
4.	Chief, Mississippi Bureau of Geology P.O. Box 5348 Jackson, MS 39216 601/354-6228	Curtis Stover
5.	Coastal Ecologist Mississippi Department of Wildlife Conservation Bureau of Marine Resources P.O. Drawer 959 Long Beach, MS 39560 601/864-4602	Larry Lewis
6.	Environmental Engineer Mississippi Bureau of Pollution Control Hazardous Waste Division P.O. Box 10385 Jackson, MS 39209 601/961-5072	Cindy Rich
7.	Chief, Industrial Wastewater Section Mississippi Bureau of Pollution Control Jackson, MS 39209 601/961-5171	Bill Barnett, P.E.
8.	Federal Activities Coordinator, Environmental Assessment Branch U.S. Environmental Protection Agency, Region IV, Atlanta, GA 404/881-3776	Arthur Linton

APPENDIX C

TENANT ORGANIZATIONS AND MISSIONS

APPENDIX C
TENANT ORGANIZATIONS AND MISSIONS

The following is a listing of the major tenant organizations stationed at Keesler Air Force Base, along with a description of their missions.

7th Airborne Communications and Control Squadron (TAC)

The mission of ABCCC (Airborne Battlefield Communications and Control Center) unit is to serve as an airborne extension of a TACC. As an integral element in a theater's communications net, it exerises command and control over all elements of air power assigned by the TAC.

403 Reserve Weather Reconnaissance Wing (AFRES)

Airlift troops, supplies, and equipment into prepared or unprepared landing areas either by parachute or by air landing to continuously supply forces until they are withdrawn or are supplied by other means. Accomplish intra-theater airlift of supplies, personnel and equipment for a combat force as directed by the theater commander. Perform aeromedic evacuation of personnel.

53rd Weather Reconnaissance Squadron (MAC)

The mission of the 53rd Weather Reconnaissance Squadron is to provide special and routine weather reconnaissance and atmospheric sampling in accordance with mission priorities established by Headquarters Air Rescue Service, and 9th Weather Reconnaissance Wing.

1839th Electronics Installation Group

The mission of the 1839th Electronics Installation Group is to install ground CEM facilities and to perform mobile depot maintenance of ground CEM equipment and facilities as directed by South Comm Area; to conduct electromagnetic compatibility studies as directed by HQ AFSC; and to provide technical assistance and advice to the 214th Elec. Install. Sq, ANG.

2052 Communications Squadron

Provides the AFCC/USAF approved communications electronics services to include Autovon and Autodin tributary service, flight fac (AUTOVON) (AUTODIN) navigational aids systems, base telephone system, and closed circuit TV required to support the mission of ATC, Keesler AFB, and AFCC.

APPENDIX C
(Continued)
TENANT ORGANIZATIONS AND MISSIONS

Detachment 2, 24th Weather Squadron (MAC)

Within the capability of Det 22 24th WXSQ, Weather service will be provided to support the peacetime and wartime mission of the organizations on Keesler Air Force Base.

AF Audit Agency

The mission of the AFAA is to provide all levels of Air Force management with an independent, objective, and constructive evaluation of the effectiveness and efficiency with which managerial responsibilities (including financial, operational, and support activities) are carried out.

3314 Management Engineering Detachment 2

Administrates at base level manpower management program. Provides base units with management advisory services, manpower, and organization services and conducts management engineering studies as directed by ATC/XPM.

Detachment 812 Air Force Office of Special Investigation

Provide criminal and counterintelligence investigative service to AF commanders; provide investigative service in cases involving fraud vs government; provide other specialized investigative services as directed by HQ USAF.

USAFSS Liaison Office

Furnish support to the commander USAFSAAS in assignments, security, and training matters; also provide the facility with the assistance needed to make the student progression through school as cost effective as possible.

OLF 1701 MOBSS

Recruit personnel from the 27230th and 30434th schools for combat control duty.

Field Training Detachment 318

To provide training and assistance in OJT management for Keesler and for Columbus AFB on TDY basis.

Defense Property Disposal Office

Responsible for the proper disposal of all DOD excess/waste property whether by sale or by contract. DPDO manages the disposal of base-generated hazardous wastes.

APPENDIX C
(Continued)
TENANT ORGANIZATIONS AND MISSIONS

Other Tenants

Air Force Communications/Electronics Doctrine Office

Det 2, 375 Aeromedical Airlift Wing

Det 5, Headquarters, Air Weather Service (MAC)

Det 8, Air Force Commissary Service

Liaison Office, 23rd Air Defense Squadron (TAC)

Liaison Office, 6960th Electronic Security Wing

Liaison Office, Military Airlift Command Operating Staff

American Red Cross

APPENDIX D

SUPPLEMENTAL BASE FINDINGS

TABLE D.1
LIST OF PESTICIDES
1983 INVENTORY
KEESLER AFB

Baygon 1% Liquid
Gold Crest C-100
Vescol Chlordane Granular
Denatured Alcohol
D-Tox 4E
Diazinon Powder
Dursban-M
Malathion 57%
Oil-i-cide
Pyrethrum Spray
Sevin Dust
Eaton's Bait Blocks
d-Phenothrin 2%
Urox Liquid Oil
Ortho Paraquat
Rozol Tracking Powder
Roach Powder
Avitrol
Spray-sect
Prentox DDVP
Wasp-Freeze
Ficam 76%
Pivalyn
Baygon 2% Powder

Source: Keesler AFB Base Documents

TABLE D.2
SPECIFIC WATER QUALITY CRITERIA
FOR INTRASTATE, INTERSTATE, AND COASTAL WATERS

1. SHELLFISH HARVESTING AREAS

Waters classified for this use are for propagation and harvesting shellfish for sale or use as a food product. These waters shall meet the requirements set forth in the latest edition of the National Shellfish Sanitation Program, Manual of Operations, Part I, Sanitation of Shellfish Growing Areas, as published by the U.S. Public Health Service.

In considering the acceptability of a proposed site for disposal of bacterially-related wastewater in or near waters with this classification, the Permit Board shall consider the relative proximity of the discharge to shellfish harvesting beds.

a. Bacteria: The median fecal coliform MPN (Most Probable Number) of the water shall not exceed 14 per 100 ml, and not more than ten percent (10%) of the samples shall ordinarily exceed an MPN of 43 per 100 ml in those portions of areas most probably exposed to fecal contamination during most unfavorable hydrographic and pollutional conditions.

b. Dissolved oxygen: Dissolved oxygen concentrations shall be maintained at a daily average of not less than 5.0 mg/1 with an instantaneous minimum of not less than 4.0 mg/l in streams; shall be maintained at a daily average of not less than 5.0 mg/l with an instantaneous minimum of not less than 4.0 mg/l in estuaries and in the tidally-affected portions of streams; and shall be maintained at a daily average of not less than 5.0 mg/l with an instantaneous minimum of not less than 4.0 mg/l in the epilimnion (i.e., the surface layer of lakes and impoundments that are thermally stratified, or five feet from the water's surface [mid-depth if the lake or impoundment is less than 10 feet deep at the point of sampling]) for lakes and impoundments that are not stratified.

Epilimnion samples may be collected at the approximate mid-point of that zone (i.e., the mid-point of the distance or if the epilimnion is more than five feet in depth, then at five feet from the water's surface).

2. RECREATION

The quality of waters in this classification are to be suitable for recreational purposes, including such water contact activities as swimming and water skiing. The waters shall also be suitable for use for which waters of lower quality will be satisfactory.

TABLE D.2
SPECIFIC WATER QUALITY CRITERIA
FOR INTRASTATE, INTERSTATE, AND COASTAL WATERS

(Continued)

In considering the acceptability of a proposed site for disposal of bacterially-related wastewater in or near waters with this classification, the Permit Board shall consider the relative proximity of the discharge to areas of actual water contact activity.

a. Bacteria: Fecal coliform shall not exceed a geometric mean of 200 per 100 ml nor shall more than ten percent (10%) of the samples examined during any month exceed 400 per 100 ml.

b. Specific Conductance: There shall be no substances added to increase the conductivity above 1000 micromhos/cm for freshwater streams.

c. Dissolved Solids: There shall be no substances added to the water to cause the dissolved solids to exceed 750 mg/l as a monthly average value, nor exceed 1500 mg/l at any time for freshwater streams.

d. Dissolved oxygen: Dissolved oxygen concentrations shall be maintained at a daily average of not less than 5.0 mg/l with an instantaneous minimum of not less than 4.0 mg/l in streams; shall be maintained at a daily average of not less than 5.0 mg/l with an instantaneous minimum of not less than 4.0 mg/l in estuaries and in the tidally affected portions of streams; and shall be maintained at a daily average of not less than 5.0 mg/l with an instantaneous minimum of not less than 4.0 mg/l in the epilimnion (i.e., the surface layer of lakes and impoundments that are thermally stratified, or five feet from the water's surface [mid-depth if the lake or impoundment is less than 10 feet deep at the point of sampling]) for lakes and impoundments that are not stratified.

   Epilimnion samples may be collected at the approximate mid-point of that zone (i.e., the mid-point of the distance or if the epilimnion is more than five feet in depth, then at five feet from the water's surface).

Source: Water Quality Criteria for Intrastate, Interstate, and Coastal Waters, Mississippi Department of Natural Resources, Bureau of Pollution Control, 1982.

TABLE D.3

SURFACE WATER QUALITY DATA

For Period Oct. 1983 To Dec. 1983

Site No.	Parameter Measured Quantity		
	pH Average	Oil-Grease (mg/l) Average/Limit	Suspended Solids (mg/l) Average/Limit
SD- 2	6.2	0.3/15.	65./50.
SD- 3	6.2	0.3/15.	78./50.
SD-10	6.1	0.3/15.	7.0/50.
SD-11	6.1	0.3/15.	4.0/50.
SD-12	6.1	0.3/15.	5.0/50.
SD-13	6.1	0.3/15.	4.0/50.
SD-17	6.1	0.3/15.	13./50.
SD-29	6.1	0.3/15.	5.0/50.
SD-31	6.1	0.3/15.	3.0/50.
SD-32	6.1	0.3/15.	3.0/50.

TABLE D.4
LIST OF POL TANKS

Location	Volume (Gal.)	Status*	Contents
Bldg. 4430 Motor Pool	1,000	UG	Waste Oil
FAC 4424 POL	420,000	AB	JP-4
FAC 6732 Fire Fighter	3,000	AB	Cont. JP-4
Bldg. 5913 Auto Hobby Shop	1,000	UG	Waste Oil
Bldg. 6728 Base Marina	10,000	UG	Regular Gas
	500	AB	Regular Gas
Bldg. 4409 Fuels Mgmt.	25,000	UG	JP-4
	25,000	UG	JP-4
	25,000	UG	JP-4
	25,000	UG	JP-4
	25,000	UG	JP-4
	25,000	UG	JP-4
FAC 4400 Fuels Mgmt.	5,014	UG	Empty
	6,045	UG	Empty
	6,045	UG	Empty
	6,045	UG	Empty
	5,014	UG	Empty
	5,014	UG	Pickled with Caustic Soda
	5,014	UG	Recoverable JP-4
Bldg. 4038 Fuels Mgmt.	5,000	UG	Unleaded Gasoline
	8,000	UG	Regular Gasoline
	8,000	UG	Unleaded Gasoline
	5,000	UG	Diesel Fuel
Bldg. 4403 Fuels Mgmt.	1,000	UG	Waste Petroleum Products
Aerospace Grd. Eqpmt. (AGE)	1,000	UG	Regular Gasoline
	500	UG	Diesel Fuel
	500	UG	JP-4
Keesler Aero Club	2,000	UG	Regular Gasoline

TABLE D.4
(Continued)
LIST OF POL TANKS

Location	Volume (Gal.)	Status*	Contents
Bldg. 1504 Exchg. Sta. (BX)	4,000	UG	Unleaded Gasoline
	3,000	UG	Unleaded Gasoline
	4,000	UG	Premium Gasoline
	4,000	UG	Regular Gasoline
	1,000	UG	Waste Oil
Bldg. 0824 Dental Clinic	1,000	UG	No. 2 Fuel Oil (Htg. Fuel)
Bldg. 0701 Sablich Ctr.	4,000	UG	No. 2 Fuel Oil (Htg. Fuel)
Bldg. 2101 Muse Manor	6,000	UG	No. 2 Fuel Oil (Htg. Fuel)
Bldg. 3101 Locker House	8,000	UG	No. 2 Fuel Oil (Htg. Fuel)
Bldg. 4101 Ctl. Htg. Plt.	20,000	UG	No. 2 Fuel Oil (Htg. Fuel)
Bldg. 6901 Bryan Hall	2,000	UG	No. 2 Fuel Oil (Htg. Fuel)
Bldg. 6902 Jones Hall	2,000	UG	No. 2 Fuel Oil (Htg. Fuel)
Bldg. 6903 Hewes	1,000	UG	No. 2 Fuel Oil (Htg. Fuel)
Bldg. 7001 Triangle Dorm	4,000	UG	NO. 2 Fuel Oil (Htg. Fuel)
Bldg. 7101 Triangle Dorm	4,000	UG	NO. 2 Fuel Oil (Htg. Fuel)
Bldg. 7102 Triangle Dorm	4,000	UG	NO. 2 Fuel Oil (Htg. Fuel)
Bldg. 7103 Triangle Dorm	4,000	UG	NO. 2 Fuel Oil (Htg. Fuel)
Bldg. 7202 Triangle Dorm	4,000	UG	NO. 2 Fuel Oil (Htg. Fuel)

Bldg. 3931 Old Motor Pool and Maintenance Shop Tanks:

1. 6,000 Gal UG tank abandoned filled with sand.
2. 6,000 Gal UG tank abandoned filled with sand.
3. 1,500 Gal UG tank abandoned filled with sand.

* UG - underground
AB - above ground

Source: Keesler AFB Installation Documents.

APPENDIX E

MASTER LIST OF SHOPS

APPENDIX E
MASTER LIST OF SHOPS

Shop	Bldg. #	Handles Hazardous Material	Generates Hazardous Waste	Current Waste Management
3380 Air Base Group/DA				
Life Support	230	Yes	No	-
Field Printing	901	Yes	Yes	Sanitary Sewer
AIRCRAFT MAINTENANCE SQUADRON				
Meterological Equipment Maintenance	4203	Yes	No	-
AFSAT Communications	4116	Yes	No	-
Doppler Inertial Navigation System	4203	Yes	No	-
Airborne Navigational Maintenance	4203	Yes	Yes	Base Refuse
Capsule Maintenance	4203	No	No	-
Communications Maintenance	4302	Yes	No	-
PMEL	4420	Yes	No	-
EWS Maintenance	6903	Yes	No	-
3380 Air Base Group/SP				
Combat Arms	1907	Yes	Yes	OBC
Aircrew Life Support	4205	No	No	-
CIVIL ENGINEERING SQUADRON				
POL Maintenance	4038	Yes	Yes	OBC/FPTA
Heating/Boiler Plant	4101	Yes	Yes	Sanitary Sewer
Interior/Exterior Electric	4107	Yes	No	-
Fire Department	4216	Yes	No	-

APPENDIX E
(Continued)
MASTER LIST OF SHOPS

Shop	Bldg. #	Handles Hazardous Material	Generates Hazardous Waste	Current TSD Method
USAF HOSPITAL				
Pathology	468	Yes	No	
Medical Equipment Maintenance	468	Yes	No	-
Clinical Research Lab	404	Yes	Yes	Sanitary Sewer
Dental Clinic	824	Yes	Yes	Sanitary Sewer
MORALE, WELFARE AND RECREATION SERVICES				
Aero Club	4204	Yes	Yes	OBC
Auto Hobby	5904	Yes	Yes	OBC
Wood Hobby	5904	Yes	No	-
Ceramics/Welding	5904	Yes	No	-
Golf Course/Marina	6728	Yes	No	-
ORGANIZATIONAL MAINTENANCE SQUADRON				
Base Ops (Transient Maint.)	4205	Yes	Yes	OBC
Non-Powered AGE	4205	No	No	-
Maintenance Support	4205	No	No	-
TAC/MAC Flightline Branch	4205	No	No	-
Inspection Dock	4205	Yes	Yes	OBC
Flightline Branch	4205	Yes	No	-
ISO Dock	4205	Yes	No	-
AIRBASE GROUP SERVICES				
Laundry/Dry Clean	4103	Yes	Yes	Sanitary Sewer/OBC

APPENDIX E
(Continued)
MASTER LIST OF SHOPS

Shop	Bldg. #	Handles Hazardous Material	Generates Hazardous Waste	Current TSD Method
SECURITY POLICE				
Armory and Operations	3913	Yes	No	-
TECHNICAL TRAINING WING				
Painting	231	Yes	No	-
Carpenter	231	Yes	No	-
Sheet Metal	231	Yes	No	-
Welding	231	Yes	No	-
Tech Services	231	Yes	No	-
Electronics Services	231	Yes	No	-
Machine Shop	231	Yes	No	-
Engraving shop	231	Yes	No	-
Printed Circuits Shop	231	Yes	No	-
Visual Services	231	Yes	Yes	Sanitary Sewer
Computer Systems	231	No	No	-
Avionics Systems	231	No	No	-
TRANSPORTATION SQUADRON				
Refueling Maintenance	4409	Yes	No	-
General Purpose Shop	4430	Yes	No	-
Allied Trades	4430	Yes	No	-
Preserving/Packing	4605	Yes	No	-
Motor Pool	4430	Yes	Yes	OBC/Sanitary Sewer
1839 EIG GROUP				
Crypto	7701	No	No	-
Electronics Shop	7701	No	No	-
Radio Maintenance	7701	No	No	-

APPENDIX F

PHOTOGRAPHS

KEESLER AFB, MISSISSIPPI

SOUTHWEST END OF BASE

Early 1940's

KEESLER AFB, MISSISSIPPI
June 5, 1946

KEESLER AFB
January 12, 1984

TEL Sludge Burial Site in Landfill No. 1

TEL Sludge Burial Site at
Training Annex No. 1

ES ENGINEERING-SCIENCE

KEESLER AFB
January 12, 1984

Landfill No. 1, North Section

Landfill at Training Annex No. 1

ES ENGINEERING-SCIENCE

KEESLER AFB
January 12, 1984

Pesticide Rinse Disposal Pit

Fire Protection Training Area
and Site of Landfill No. 3

KEESLER AFB
January 12, 1984

Transformer Storage Site

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with represenatives from USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering-Science, and CH2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of the IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Records Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

FIGURE 1

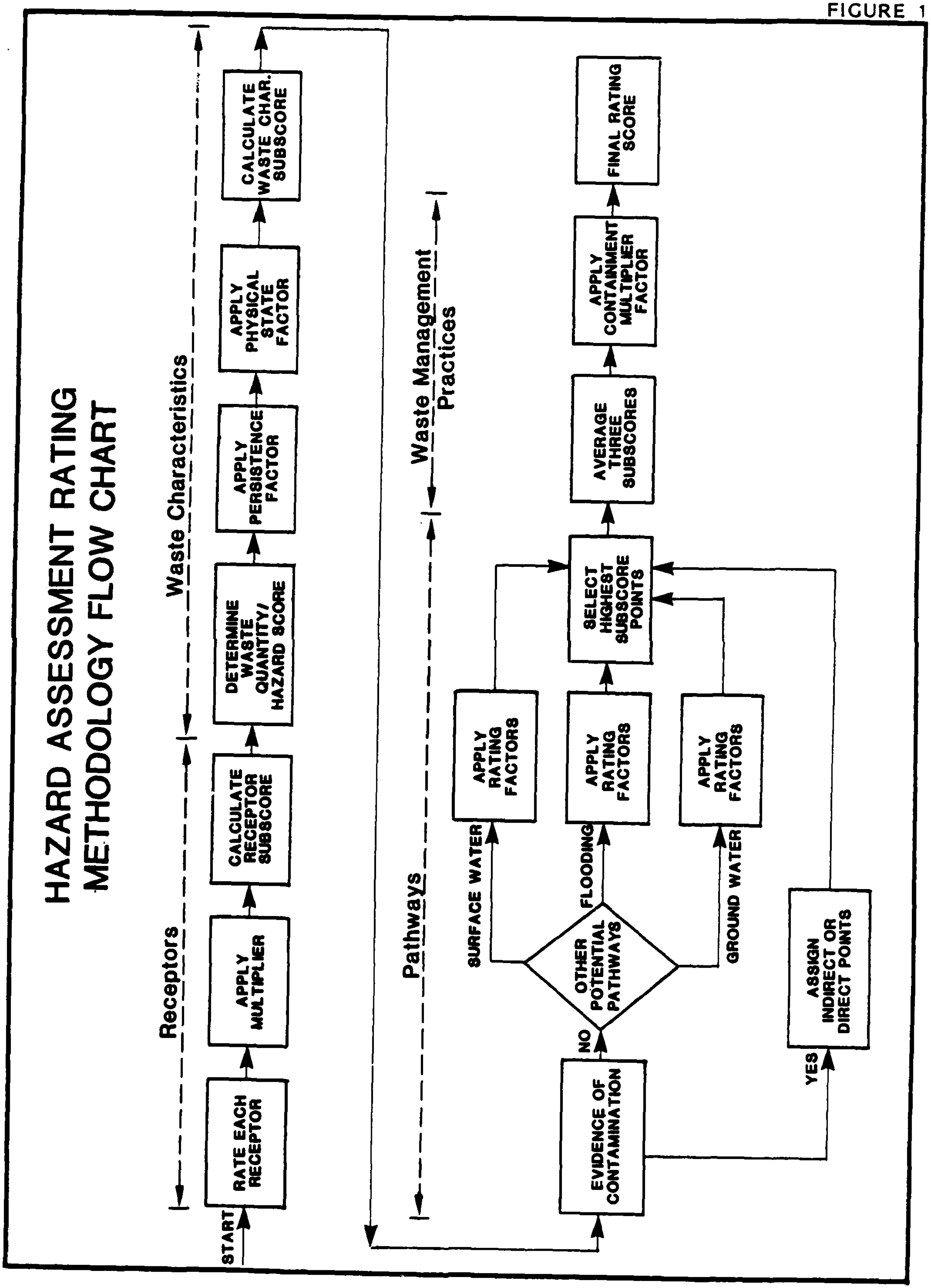
HAZARD ASSESSMENT RATING
METHODOLOGY FLOW CHART
Receptors
Waste Characteristics
START
RATE EACH RECEPTOR
APPLY MULTIPLIER
CALCULATE RECEPTOR SUBSCORE
DETERMINE WASTE QUANTITY/ HAZARD SCORE
APPLY PERSISTENCE FACTOR
APPLY PHYSICAL STATE FACTOR
CALCULATE WASTE CHAR. SUBSCORE
Pathways
Waste Management Practices
EVIDENCE OF CONTAMINATION
NO
YES
OTHER POTENTIAL PATHWAYS
SURFACE WATER
FLOODING
GROUND WATER
APPLY RATING FACTORS
APPLY RATING FACTORS
APPLY RATING FACTORS
ASSIGN INDIRECT OR DIRECT POINTS
SELECT HIGHEST SUBSCORE POINTS
AVERAGE THREE SUBSCORES
APPLY CONTAINMENT MULTIPLIER FACTOR
FINAL RATING SCORE

FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ____________________

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY ____________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
		Subtotals	______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals	______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______ Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ☐

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	H
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year flood-plain	In 10-year flood-plain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX H

HAZARD ASSESSMENT RATING FORMS

APPENDIX H

TABLE OF CONTENTS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Etching Shop Drainage Pit
Location: Adjacent to Building 0231
Date of Operation or Occurrence: Prior to 1981
Owner/Operator: Keesler AFB
Comments/Description: Acids and Organics disposed.

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	2	6	12	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			109	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.90 = 72

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

72 x 1.00 = 72

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	3	8	24	24
Subtotals			70	108
Subscore (100 x factor score subtotal/maximum score subtotal)				65
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			100	114
Subscore (100 x factor score subtotal/maximum score subtotal)				88

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 88

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		61
Waste Characteristics		72
Pathways		88
Total	221 divided by 3 =	74 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

74 x 1.00 = 74 FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Fire Protection Training Area
Location: Landfill No. 3
Date of Operation or Occurrence: 1955 - Present
Owner/Operator: Keesler AFB
Comments/Description: Until 1981, exercises conducted with no concrete foundation.

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	2	6	12	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			111	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.80 = 64

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.00 = 64

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			76	108
Subscore (100 x factor score subtotal/maximum score subtotal)				70
2. Flooding	1	1	1	3
Subscore (100 x factor score/3)				33
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			100	114
Subscore (100 x factor score subtotal/maximum score subtotal)				88

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 88

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		62	
Waste Characteristics		64	
Pathways		88	
Total	214	divided by 3 =	71 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

71 x 1.00 = 71

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 2
Location: North end of base at golf course
Date of Operation or Occurrence: 1947 - 48
Owner/Operator: Keesler AFB
Comments/Description: Site adjacent to old runway since removed routine burning during use.

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	2	6	12	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			119	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 66

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.00 = 48

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			76	108
Subscore (100 x factor score subtotal/maximum score subtotal)				70
2. Flooding	1	1	1	3
Subscore (100 x factor score/3)				33
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			100	114
Subscore (100 x factor score subtotal/maximum score subtotal)				88

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 88

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		66	
Waste Characteristics		48	
Pathways		88	
Total	202	divided by 3 =	67 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

67 x 1.00 = 67

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Pesticide Rinse Disposal Pit
Location: Entomology Shop
Date of Operation or Occurrence: 1950's - 1981
Owner/Operator: Keesler AFB
Comments/Description: A "shell drainage pit"

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	2	6	12	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			101	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.90 = 54

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

54 x 1.00 = 54

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	16	48	48
Subtotals			92	132
Subscore (100 x factor score subtotal/maximum score subtotal)				70
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			84	114
Subscore (100 x factor score subtotal/maximum score subtotal)				74

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 74

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56	
Waste Characteristics	54	
Pathways	74	
Total 184 divided by 3 =		61 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

61 x 1.00 = 61

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Transformer Storage Site
Location: Southeast boundary of base near old DPDO.
Date of Operation or Occurrence: 1960's - 1977
Owner/Operator: Keesler AFB
Comments/Description: Stored on gravelled area adjacent to fence.

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			68	108
Subscore (100 x factor score subtotal/maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
Subtotals			76	114
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57	
Waste Characteristics		60	
Pathways		67	
Total	184 divided by 3 =		61 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

61 x 1.00 = \ 61 \

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: TEL Sludge Burial Site in Landfill No. 1
Location: North end of Landfill No. 1
Date of Operation or Occurrence: 1942
Owner/Operator: Keesler AFB
Comments/Description: Types of containers unknown.

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 0.75 = 45

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi- plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			68	108
Subscore (100 x factor score subtotal/maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	2	8	16	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		57	
Waste Characteristics		45	
Pathways		81	
Total	183 divided by 3 =		61 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

61 x 0.95 = \ 58 \
FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: TEL Sludge Burial Site at Training Annex No. 1
Location: Training Annex No 1.
Date of Operation or Occurrence: 1970
Owner/Operator: Keesler AFB
Comments/Description: Buried in drums adjacent to power pole in trailer lot.

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	2	6	12	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			109	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 0.75 = 45

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			76	108
Subscore (100 x factor score subtotal/maximum score subtotal)				70
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
Subtotals			76	114
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 70

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		61	
Waste Characteristics		45	
Pathways		70	
Total	176 divided by 3 =		59 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

59 x 0.95 = \ 56 \

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 3
Location: North end of base, Northeast of Munitions storage.
Date of Operation or Occurrence: 1950 - 1975.
Owner/Operator: Keesler AFB
Comments/Description: Trench and fill operation for normal base refuse.

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	2	6	12	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			111	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 20

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

20 x 0.40 = 8

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

8 x 1.00 = 8

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			76	108
Subscore (100 x factor score subtotal/maximum score subtotal)				70
2. Flooding	1	1	1	3
Subscore (100 x factor score/3)				33
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			100	114
Subscore (100 x factor score subtotal/maximum score subtotal)				88

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 88

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		62	
Waste Characteristics		8	
Pathways		88	
Total	158	divided by 3 =	53 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

53 x 1.00 = \ 53 \

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 1
Location: Southwest corner of base
Date of Operation or Occurrence: 1940's, closed in 1950.
Owner/Operator: Keesler AFB
Comments/Description: Present site of golf course

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 20

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

20 x 0.40 = 8

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

8 x 1.00 = 8

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			68	108
Subscore (100 x factor score subtotal/maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	2	8	16	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	8
Pathways	81
Total 146 divided by 3 =	49 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

49 x 1.00 = 49

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill at Training Annex No. 1
Location: Training Annex No. 1 (Thrower Park)
Date of Operation or Occurrence: 1968 - 1971
Owner/Operator: Keesler AFB
Comments/Description: Northeast end of annex; routine burning during use.

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	2	6	12	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			119	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 66

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 20

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

20 x 0.40 = 8

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

8 x 1.00 = 8

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			76	108
Subscore (100 x factor score subtotal/maximum score subtotal)				70
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
Subtotals			76	114
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 70

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		66	
Waste Characteristics		8	
Pathways		70	
Total	144 divided by 3 =		48 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

48 x 1.00 = 48

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Gasoline Spill at Naval Reserve Park
Location: Naval Reserve Park (Marina)
Date of Operation or Occurrence: 1981
Owner/Operator: Keesler AFB
Comments/Description: A ventilation well remains to promote evaporation.

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	2	6	12	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			111	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.90 = 72

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

72 x 1.00 = 72

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			76	108
Subscore (100 x factor score subtotal/maximum score subtotal)				70
2. Flooding	1	1	1	3
Subscore (100 x factor score/3)				33
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			100	114
Subscore (100 x factor score subtotal/maximum score subtotal)				88

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 88

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		62	
Waste Characteristics		72	
Pathways		88	
Total	222	divided by 3 =	74 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

74 x 0.10 = 7

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Low Level Radioactive Waste Burial Site
Location: Landfill No. 1
Date of Operation or Occurrence: 1950's - 1960
Owner/Operator: Keesler AFB
Comments/Description: Tubes and other low-level materials.

Site Rated by: E. H. Snider, J. R. Absalon, R. J. Reimer

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 0.50 = 30

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			68	108
Subscore (100 x factor score subtotal/maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	2	8	16	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57		
Waste Characteristics	30		
Pathways	81		
Total 168 divided by 3 =		56	Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

56 x 0.10 = 6

FINAL SCORE

APPENDIX I

REFERENCES

APPENDIX I

REFERENCES

Bicker, Alvin R., 1969. Geologic Map of Mississippi. Mississippi U.S. Geological Survey Map, scale 1:500,000.

Boswell, E.H., 1984. Personal Communication with Chief, Ground-Water Section, U.S. Geological Survey Water Resources Division, Jackson, MS. January 13. 601/960-4600.

Brown, G.F., Foster, V.M., Adams, R.W., Reed, E.W. and Padgett, H.D., 1944. Geology and Ground-Water Resources of the Coastal Area in Mississippi. Mississippi State Geological Survey Bulletin 60.

Fenneman, N.M., 1930. Physical Divisions of the United States. U.S. Geological Survey Map, scale 1:7,000,000.

Lusk, T.W., 1953. Water Levels and Artesian Pressures in Observation Wells in Mississippi, 1938 - 1952. Mississippi State Geological Survey Bulletin 77.

Newcome, R., 1975. The Miocene Aquifer System in Mississippi. U.S. Geological Survey Water Resources Investigations 46-75.

Newcome, R., Shattles, D.E. and Humphreys, C.D., 1968. Water for the Growing Needs of Harrison County, Mississippi. U.S. Geological Survey Water Supply Paper 1856.

Priddy, R.R., 1955. Fresh Water Strata of Mississippi as Revealed by Electrical Log Studies. Mississippi State Geological Survey Bulletin 83.

Shows, T.N., 1970. Water Resources of Mississippi. Mississippi State Geological Survey Bulletin 113.

Stover, Curtis, 1984. Personal Communication with Chief, Environmental Section, Mississippi Bureau of Geology, Jackson, MS. February 6. 601/354-6228.

U.S. Department of Agriculture Soil Conservation Service, 1975. Soil Survey of Harrison County, Mississippi.

Wasson, B.E., 1980. Sources for Water Supplies in Mississippi. U.S. Geological Survey and Mississippi Research and Development Center Cooperative Study.

APPENDIX J

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

APPENDIX J

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

ABG: Air Base Group

ACCS: Airborne Command and Cotnrol Squadron.

ACFT MAINT: Aircraft Maintenance.

AF: Air Force.

AFB: Air Force Base.

AFESC: Air Force Engineering and Services Center.

AFFF: Aqueous Film Forming Foam, a fire extinquishing agent.

AFR: Air Force Regulation.

Ag: Chemical symbol for silver.

AGE: Aerospace Ground Equipment.

ALLUVIUM: Materials eroded, transported and deposited by streams.

ALLUVIAL FAN: A fan-shaped deposit formed by a stream either where it issues from a narrow mountain valley into a plain or broad valley, or where a tributary stream joins a main stream.

ANTICLINE: A fold in which layered strata are inclined down and away from the axes.

ARTESIAN: Ground water contained under hydrostatic pressure.

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring.

AROMATIC: Description of organic chemical compounds in which the carbon atoms are arranged into a ring with special electron stability associated. Aromatic compounds are often more reactive than non-aromatics.

ATC: Air Training Command.

AVGAS: Aviation Gasoline.

BEE: Bioenvironmental Engineer.

BES: Bioenvironmental Engineering Services.

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals.

BIODEGRADABLE: The characteristic of a substance to be broken down from complex to simple compounds by microorganisms.

BOWSER: A portable tank, usually under 200 gallons in capacity.

BX: Base Exchange.

CALIBRATING FLUID: Oil based solution.

CAMS: Consolidated Aircraft Maintenance Squadron.

CARBON REMOVER: Organic cleaning agent.

Cd: Chemical symbol for cadmium.

CE: Civil Engineering.

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act.

CES: Civil Engineering Squadron.

CIRCA: About; used to indicate an approximate date.

CLEANING FLUIDS: Organic and alkaline cleaners.

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation.

CN: Chemical symbol for cyan_de.

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water.

COE: Corps of Engineers.

CONFINED AQUIFER: An aquifer bounded above and below by impermeable strata or by geologic units of distinctly lower permeability than that of the aquifer itself.

CONFINING UNIT: A geologic unit with low permeability which restricts the movement of ground water.

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water.

CORROSION REMOVER: Alkaline cleaning solution.

Cr: Chemical symbol for chromium.

2,4-D: Abbreviation for 2,4-dichlorophenoxyacetic acid, a common weed killer and defoliant.

DEQPPM: Defense Environmental Quality Program Policy Memorandum

DET: Detachment.

DIP: The angle at which a stratum is inclined from the horizontal.

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure.

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water.

DOD: Department of Defense.

DOT: Department of Transportation

DOWNGRADIENT: In the direction of decreasing hydraulic static head; the direction in which ground water flows.

DPDO: Defense Property Disposal Office, previously included Redistribution and Marketing (R&M) and Salvage.

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers.

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment.

EMULSIFIER: Organic solution used in NDI operation.

EP: Extraction Procedure, the EPA's standard laboratory procedure for leachate generation.

EPA: U.S. Environmental Protection Agency.

EPHEMERAL AQUIFER: A water-bearing zone typically located near the surface which normally contains water seasonally.

EROSION: The wearing away of land surface by wind, water, or chemical processes.

ES: Engineering-Science, Inc.

FAA: Federal Aviation Administration.

FACILITY: Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes.

FAULT: A fracture in rock along which the adjacent rock surfaces are differentially displaced.

FIXER SOLUTION: Photographic solution containing silver.

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year.

FLOW PATH: The direction or movement of ground water as governed principally by the hydraulic gradient.

FMS: Field Maintenance Squadron.

FPTA: Fire Protection Training Area.

FY: Fiscal Year

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown organic compounds.

GROUND WATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure.

GROUND-WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water.

HALON: A fluorocarbon fire extinguishing compound.

HALOGEN: The class of chemical elements including fluorine, chlorine, bromine, and iodine.

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material.

HARM: Hazard Assessment Rating Methodology.

HAZARDOUS SUBSTANCE: Under CERCLA, the definition of hazardous substance includes:

1. All substances regulated under Paragraphs 311 and 307 of the Clean Water Act (except oil);

2. All substances regulated under Paragraph 3001 of the Solid Waste Disposal Act;

3. All substances regulated under Paragraph 112 of the Clean Air Act;

4. All substances which the Administrator of EPA has acted against under Paragraph 7 of the Toxic Substance Control Act;

5. Additional substances designated under Paragraph 102 of the Superfund bill.

HAZARDOUS WASTE: As defined in RCRA, a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste.

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations.

HQ: Headquarters.

HWAP: Hazardous Waste Accumulation Point

HWMF: Hazardous Waste Management Facility.

HYDROCARBONS: Organic chemical compounds composed of hydrogen and carbon atoms chemically bonded. Hydrocarbons may be straight chain, cyclic, branched chain, aromatic, or polycyclic, depending upon arrangement of carbon atoms. Halogenated hydrocarbons are hydrocarbons in which one or more hydrogen atoms has been replaced by a halogen atom.

INCOMPATIBLE WASTE: A waste unsuitable for co-mingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the air, human health, and environmental standards.

INFILTRATION: The movement of water through the soil surface into the ground.

IRP: Installation Restoration Program.

ISOPACH: Graphic presentation of geologic data, including lines of equal unit thickness that may be based on confirmed (drill hole) data or indirect geophysical measurement.

JP-4: Jet Propulsion Fuel Number Four, military jet fuel.

JP-5: Jet Propulsion Fuel Number Five, military jet fuel.

KAFB: Keesler Air Force Base.

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water.

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

LENTICULAR: A bed or rock stratum or body that is lens-shaped.

LINER: A continous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate.

LITHOLOGY: The description of the physical character of a rock.

LOESS: An essentially unconsolidated unstratified calcareous silt; commonly homogeneous, permeable and buff to gray in color.

LOX: Liquid oxygen.

LYSIMETER: A vacuum operated sampling device used for extracting pore water samples at various depths within the unsaturated zone.

MAC: Military Airlift Command.

MEK: Methyl Ethyl Ketone.

METALS: See "Heavy Metals".

METHANOL: Methyl Alcohol (combustible).

MGD: Million gallons per day.

MOGAS: Motor gasoline.

MODIFIED MERCALLI INTENSITY: A number describing the effects of an earthquake on man, structures and the earth's surface. A Modified Mercalli Intensity of I is not felt. An intensity of VI is felt indoors and outdoors and for an intensity of VII it becomes difficult for a man to remain standing. Intensities of IX to XII involve increasing levels of destruction with destruction being nearly total at an intensity of XII.

MONITORING WELL: A well used to measure ground-water levels and to obtain samples.

MORPHOLINE: Tetrahydro - 1,4-oxazine, an additive to boiler water.

MS: Mississippi.

MSL: Mean Sea Level.

MWR: Morale, Welfare and Recreation.

NCO: Non-commissioned Officer.

NCOIC: Non-commissioned Officer In-Charge.

NDI: Non-destructive inspection.

NET PRECIPITATION: The amount of annual precipitation minus annual evaporation.

NOAA: National Oceanic and Atmospheric Administration

NPDES: National Pollutant Discharge Elimination System.

OEHL: Occupational and Environmental Health Laboratory.

OIC: Officer-In-Charge.

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon.

OSI: Office of Special Investigations.

O&G: Symbols for oil and grease.

PATHOLOGICAL WASTES: Hospital waste which could potentially be contaminated with disease carrying organisms.

PCB: Polychlorinated Biphenyl; liquids used as a dielectrics in electrical equipment.

PENETRANT: Organic solution used in NDI operation.

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil.

PERMEABILITY: The capacity of a porous rock, soil or sediment for transmitting a fluid without damage to the structure of the medium.

PERSISTENCE: As applied to chemicals, those which are very stable and remain in the environment in their original form for an extended period of time.

PD-680: Cleaning solvent.

pH: Negative logarithm of hydrogen ion concentration.

PL: Public Law.

POL: Petroleum, Oils and Lubricants.

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose.

POLYCYCLIC COMPOUND: All compounds in which carbon atoms are arranged into two or more rings, usually aromatic in nature.

POTENTIALLY ACTIVE FAULT: A fault along which movement has occurred within the last 25-million years.

POTENTIOMETRIC SURFACE: The surface to which water in an aquifer would rise in tightly cased wells open only to the aquifer.

PPB: Parts per billion by weight.

PPM: Parts per million by weight.

PRECIPITATION: Rainfall.

QUATERNARY MATERIALS: The second period of the Cenozoic geologic era, following the Tertiary, and including the last 2-3 million years.

RCRA: Resource Conservation and Recovery Act.

RECEPTORS: The potential impact group or resource for a waste contamination source.

RECHARGE AREA: A surface area in which surface water or precipitation percolates through the unsaturated zone and eventually reaches the zone of saturation. Recharge areas may be natural or manmade.

RECHARGE: The addition of water to the ground-water system by natural or artificial processes.

RIPARIAN: Living or located on a riverbank.

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards.

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water.

SAX'S TOXICITY: A rating method for evaluating the toxicity of chemical materials.

SCS: U.S. Department of Agriculture Soil Conservation Service.

SEISMICITY: Pertaining to earthquakes or earth vibrations.

SLUDGE: Any garbage, refuse, or slude from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923).

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923).

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water.

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste.

STP: Sewage Treatment Plant.

2,4,5-T: Abbreviation for 2,4,5-trichlorophenoxyacetic acid, a common herbicide.

TAC: Tactical Air Command.

TCE: Trichloroethylene, an organic degreaer solvent.

TCHTW: Technical Training Wing

TDS: Total Dissolved Solids, a water quality parameter.

TEL: Tetraethyl Lead, a gasoline additive.

TOC: Total Organic Carbon.

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism.

TRANSMISSIVITY: The rate at which water is transmitted through a unit width of aquifer under a unit hydraulic gradient.

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous.

TRICHLOROETHANE: Organic degreaser solvent.

TRICHLOROETHYLENE: Organic degreaser solvent.

TSD: Treatment, storage or disposal.

TSDF: Treatment, storage or disposal facility.

TTG: Technical Training Group.

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground water.

USAF: United States Air Force.

USAFSS: United States Air Force Security Service.

USDA: United States Department of Agriculture.

USFWS: United States Fish and Wildlife Service.

USE PERMIT: Authority to allow use of federal property by a federal agency without monetary exchange.

USGS: United States Geological Survey.

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere.

WTP: Wastewater Treatment Plant.

APPENDIX K

INDEX OF SITES WITH POTENTIAL FOR ENVIRONMENTAL CONTAMINATION

APPENDIX K
INDEX OF SITES WITH POTENTIAL FOR
ENVIRONMENTAL CONTAMINATION